

Delaware River  
Basin Commission

**Water Resources  
Program**

FY 2014-2016

**PROPOSED**

May 8, 2013

## DRBC Water Resources Program FY 2014-2016

### Authorization

The Delaware River Basin Compact states:

*The commission shall annually adopt a water resources program, based upon the comprehensive plan, consisting of the projects and facilities which the commission proposes to be undertaken by the commission and other authorized governmental and private agencies, organizations and persons during the ensuing six years or such other reasonably foreseeable period as the commission may determine. (§ 3.2 DRB Compact, 1961)*

The Compact defines “project” as *...”any work, service, or activity which is separately planned, financed or identified by the commission . . . for the conservation, utilization, control development or management of water resources” (§1.2.(g)).*

### Scope & Organization

The Water Resources Program (WRP) covers fiscal years (FY) 2014 through 2016 and is a strategic plan for DRBC program direction over the next three years. The architecture is based on the requirements of the Delaware River Basin Compact (Compact) and the goals of the Key Result Areas of the *Water Resources Plan for the Delaware River Basin* (Basin Plan 2004).

The Program is presented in two parts.

**Section I: Conditions** summarizes conditions in the Basin, including hydrologic conditions, water use and sufficiency; overall assessment of water quality, landscape conditions and emerging issues that could affect long-range water resource planning and management in the Basin.

**Section II: Work Program** notes the key issues that focus the Commission’s programs and summarizes by Key Result Area the initiatives the Commission plans to undertake over the next three years.

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## I. GENERAL STATEMENT OF CONDITIONS IN THE BASIN

### A. HYDROLOGIC CONDITIONS 2011-2012

**Rainfall.** Compared to the rest of the continental US, the northeastern region experienced above-average precipitation with departures from normal reported for the 72-month period through June 2012 and significant variation across the basin. Hurricane Irene and Tropical Storm Lee produced heavy rainfall during late August and early September 2011, erasing rainfall deficits from a dry period earlier in the summer. However, conditions became much drier in the first half of 2012 as precipitation levels fell to 180-day departure deficit levels<sup>1</sup> of 6-8 inches across most of the basin and 8-12 inches in isolated portions of southern New Jersey and Delaware early in the year. By June, dry conditions remained through much of the basin, especially in southern New Jersey and Delaware (in the 8"-12" range). While precipitation varied across the basin, it was the driest January through June since 1895 in Delaware with only 53 percent of the average precipitation total.<sup>2</sup>

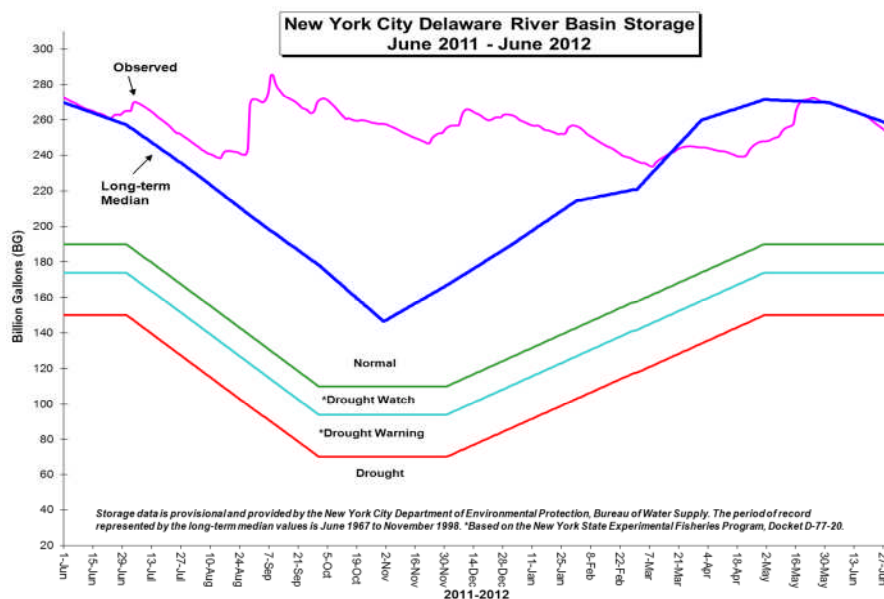
Note: Annual reports on basin hydrologic conditions are available at:  
[www.nj.gov/drbc/hydrologic/reports/annual/](http://www.nj.gov/drbc/hydrologic/reports/annual/)

**Temperature<sup>3</sup>.** Temperatures in June 2012 contributed to a record-warm first half of the year and the warmest 12-month period the nation has experienced since recordkeeping began in 1895. The July 2011-June 2012 period was the warmest 12-month period of any 12-months on records for the contiguous US; the nationally-averaged temperature of 56.0°F was 3.2°F above the long term average. The January-June period was the warmest 6 month period on record (118 years) in Delaware, New Jersey and New York; that period tied for the warmest in Pennsylvania with the period from January through June, 1998. On average, basin state temperatures were 5°F above long term state averages, ranging from +4.4°F in Pennsylvania, to +5.4°F in New York.

**Reservoir conditions and management.** The three Upper Basin reservoirs remained above the long-term median storage for the majority of the 365-day period ending June 30, 2012 (Figure 1). The River Master only directed releases on five days in July of 2011 to meet the Montague Flow Objective. Also in July, a release was made to alleviate high water temperatures in the tailwater fishery. Storage began to decline during dry periods early in 2012. A lack of snowmelt after a winter of abnormally low snowpack in the Catskills contributed to the declining storage. Releases were directed by the River Master on four days in April, the earliest in the season that directed releases were required. Reservoir storage was below the long-term median by mid-March and remained below the long-term median as of June 30, 2012.

Although periods of below normal stream-flow occurred during April 2011 to April 2012, conditions did not require the Commission to direct releases from Blue Marsh or Beltzville reservoirs to maintain the

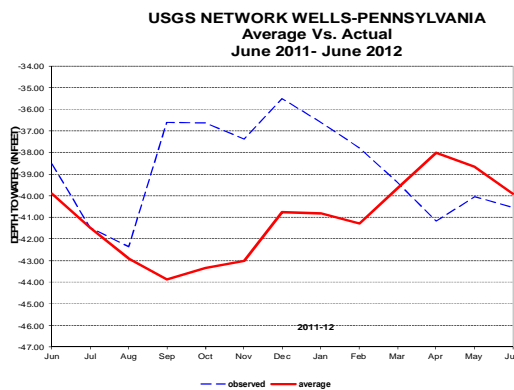
streamflow objective of 3,000 cubic feet per second (cfs) at Trenton, New Jersey. However, it is worth noting that between April 7 and 22, new minimum streamflow records at Trenton were set, based on 99 years of record.



**Figure 1. New York City's Delaware River Basin Storage, June 2011-June 2012.**

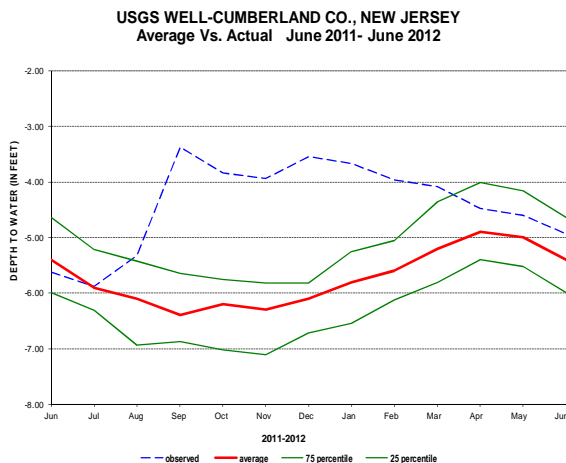
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**Groundwater conditions.** During the 365-day period ending June 30, 2012, the average monthly groundwater level in eight reported USGS observation wells in the Pennsylvania portion of the basin remained above the long-term average throughout most of the period (Figure 2). Rainfall produced from Hurricane Irene and Tropical Storm Lee in late August and early September 2011 caused groundwater to rebound from the effects of a brief dry period in the summer of 2011. Precipitation deficits and below normal snowpack early in 2012 caused the average monthly groundwater level to decline below average by June 2012.

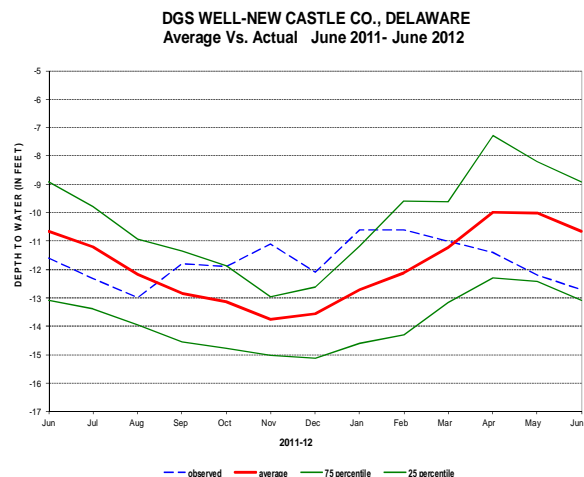


**Figure 2. PA Groundwater. Average (solid red line) vs. actual (dashed blue line) levels June 2011-June 2012 based on USGS well network.**

The Cumberland County NJ coastal plain well recorded levels within the normal range (25- to 75-percentile) until August 2011 when rain produced from Hurricane Irene and Tropical Storm Lee increased groundwater levels to above the normal range (Figure 3). Rainfall deficits early in 2012 caused levels to trend downward to within the normal range as of June 30, 2012. Monthly measurements of groundwater within the New Castle County DE coastal plain well recorded levels either above or within the normal range (25- to 75-percentile) throughout much of the 365-day period (Figure 4). As of June 30, 2012, water levels remained within the normal range, but were trending downward due to rainfall deficits in recent months.



**Figure 3. NJ Groundwater. Average (solid red line) vs. actual (dashed blue line) levels June 2011-June 2012 based on USGS well, Cumberland Co., NJ.**



**Figure 4. DE Groundwater. Average (solid red line) vs. actual (dashed blue line) levels June 2011-June 2012 based on DGS well, New Castle Co., DE.**

## B. WATER USE & SUFFICIENCY

### Water Withdrawals

Much work has been done in recent years to improve our understanding of water use and supply in the Basin. Figure 5 shows the basin-wide picture of water withdrawals, exports and consumptive use based on 2007 data. Although the availability and completeness of water use data has improved overall, due to online reporting programs by basin state agencies, there are still some deficiencies that need to be addressed. For example, agricultural water use reporting needs to improve in order to generate a more accurate assessment for this sector and an improved ability to plan for future needs.

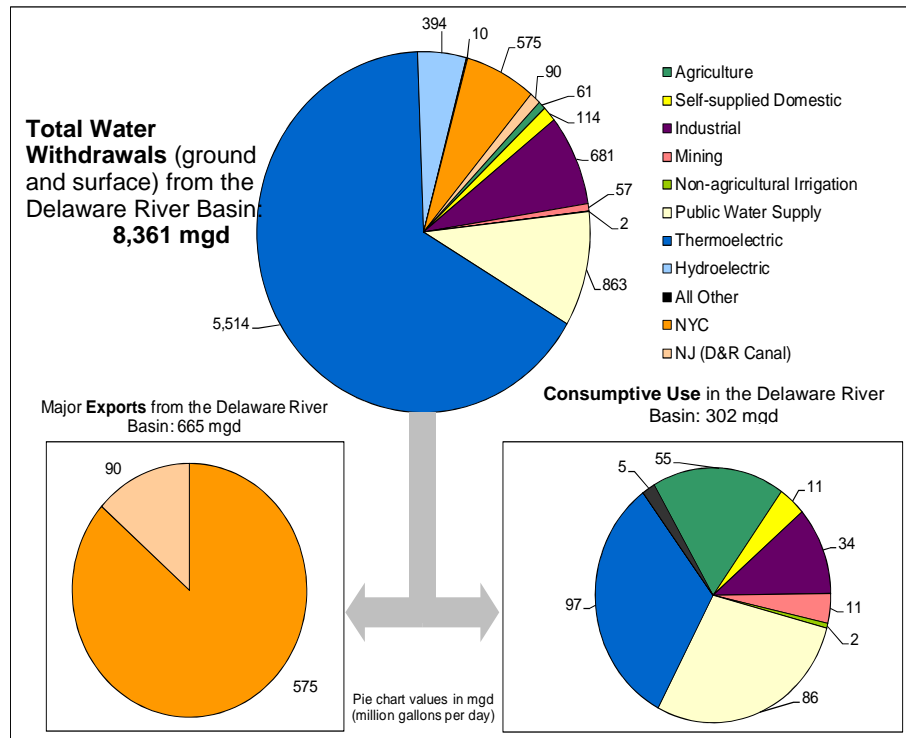


Figure 5. Withdrawals, Consumptive Use & Major Exports from the Basin 2007.

Key Delaware River Basin water use facts:

- Roughly 15 million people rely on water from the Basin for their daily water needs. Approximately 8.3 million people live in the Basin (2010 US Census) and the volume of exports to New York City and northeastern New Jersey is sufficient to supply an additional 7 million people
- Total ground and surface water withdrawals from the Basin: 8,361 mgd
- Major Exports from the Basin: 665 mgd
- Consumptive Use in the Basin: 302 mgd
- Over 90% of all water used in the Basin is obtained from surface waters.
- The dominant use sectors are:
  - power generation (thermoelectric, 68%)
  - public water supply (11%)
  - and industrial use (8%)

### Water Withdrawals and Consumptive Use

In managing water resources, the withdrawal volume may not be as important as where, when and if the water is returned to the system. Water not immediately returned is considered *consumptive use*. Figure 6 illustrates both the range of withdrawals among the basin regions and consumptive use as a percentage of total withdrawals.

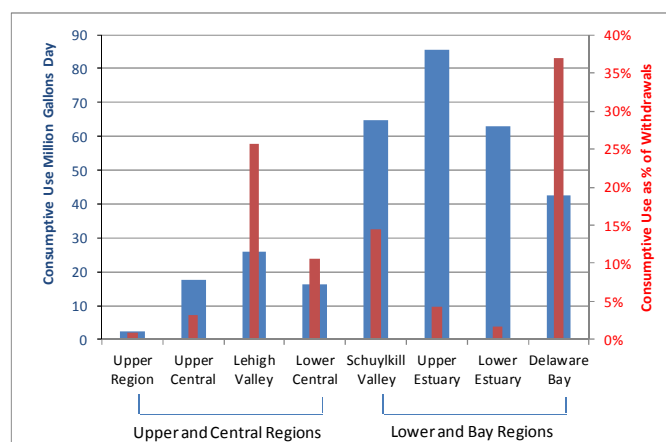
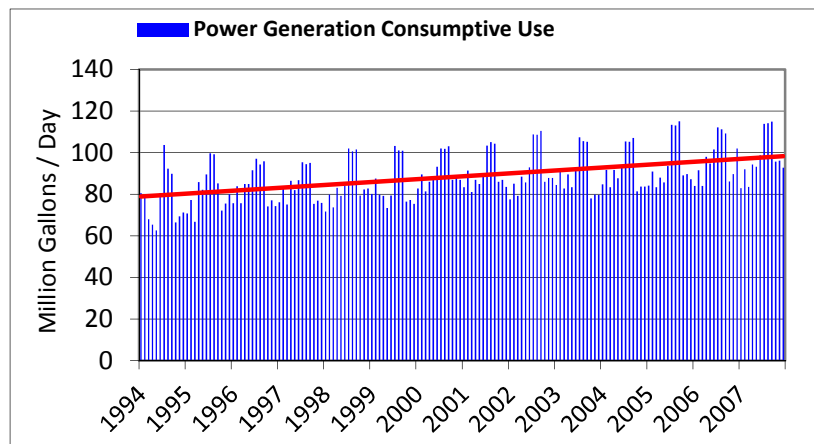


Figure 6. Consumptive Use 2007 by Basin Region as total (wide blue bar) and percentage (narrow red bar) of withdrawals.

### Cumulative Thermoelectric Withdrawals and Consumptive Use

Water withdrawals for thermoelectric power generation are primarily used for cooling purposes. The cooling process is typically achieved by either highly evaporative cooling towers or a once-through cooling process that uses a condenser to absorb heat. The two types of cooling use water in different ways. Evaporative cooling towers require a smaller volume of withdrawal but consume the majority of the water (>90% consumptive use). Once-through cooling requires a much greater availability of water but the rate of loss to evaporation is very small (typically <1%). In terms of total consumptive use (gallons per MWh), the systems are comparable, with cooling towers having slightly higher consumptive use factors.

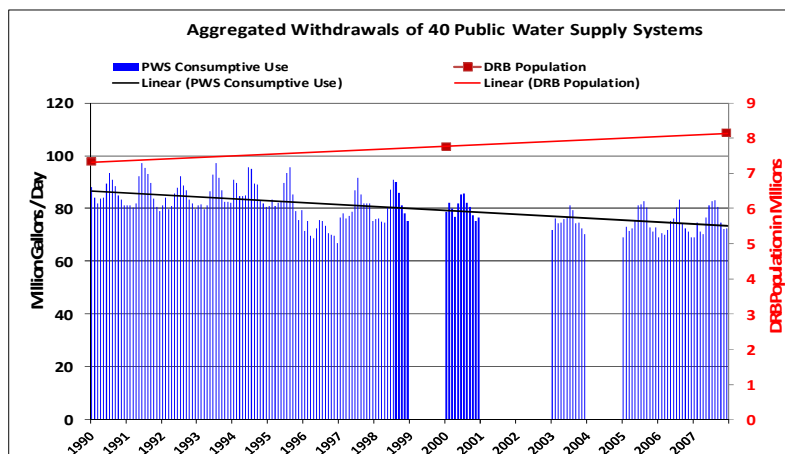
While withdrawals for the thermoelectric power sector have remained relatively constant (1994-2008), consumptive use for the same period (Figure 7) shows an increasing trend which may be explained by a switch to more consumptive cooling processes. Increases in demand for withdrawals for thermo-electric power generation are likely to occur within the next few decades. New capacity—from nuclear and fossil fuel facilities—is most certainly to be cooled using evaporative methods (e.g.,



**Figure 7. Trend in Consumptive Use for Thermoelectric Power Generation 1994-2008.**

cooling towers) thereby increasing consumptive water use. Several large energy-related facilities in the Basin have been decommissioned or acquired by other entities in recent years. In the thermoelectric sector, Exelon closed its Cromby facility (coal, oil and natural gas fired; once through cooling) on the Schuylkill River in 2011 and a large portion of its Eddystone facility, on the tidal Delaware. Unit 1 (coal fired; once through cooling) at the Eddystone plant was retired in 2011 and Unit 2 (coal fired; once through cooling) was retired in 2012. Exelon continues to operate Units 3 and 4 (oil and natural gas fired; once through cooling) at Eddystone as well as 4 combustion turbines that supply power during peak demand periods. In April of 2012 PPL acquired the Ironwood facility from AES.

### Public Water Supply Withdrawals



**Figure 8. Aggregated Withdrawals of 40 Public Water Systems in the Basin 1990-2007. In general, withdrawals have decreased even as population has increased. Note that no data is shown for months where data was incomplete to avoid skewing the displayed trend line.**

Cumulative withdrawals for the 40 major public water supply (PWS) systems, account for approximately 80% of total water demand for PWS systems in the basin. The downward trend (Figure 8) has been driven by changes in plumbing codes, enacted in the early 1990s, which required use of more efficient plumbing fixtures and fittings. In addition, education and awareness of water conservation practices have played a role in decreasing water use for this sector despite increases in population (shown by the red line in Figure 8). Although declining in the aggregate, withdrawals have increased in several systems where there are population growth hot-spots and where water conservation practices cannot offset the more rapid



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increase in population. Over the past 25 years, DRBC has enacted regulations to promote water conservation and the trend shown in Figure 8 indicates that these regulations have been successful and contributed to a decline in PWS water withdrawals. DRBC updated its regulations in 2009 with the aim of continuing to require best practices in water conservation. The revised regulation requires PWS systems to conduct an annual water audit to help identify water losses, particularly water lost due to leaky infrastructure. DRBC has performed multiple outreach efforts and the audit became a mandatory requirement in 2012.

**Industrial Withdrawals** Historic data for industrial withdrawals show a decline from levels in the early 1990's (Figure 9). The closing of the Bethlehem Steel plant in Bethlehem PA in 1995 contributed significantly to the overall decline in water use for this sector as it was the Basin's largest industrial water user. Over the past decade industrial water use has remained fairly steady in the Basin despite numerous facilities changing hands.

Refineries located within the Basin have seen a lot of turnover in recent years and in some cases are in jeopardy of permanent closure. PBF Energy purchased the Paulsboro Refinery from Valero in December, 2010, and then purchased Valero's idled Delaware City refinery in June, 2010. The Delaware City refinery was restarted in October, 2011, and both

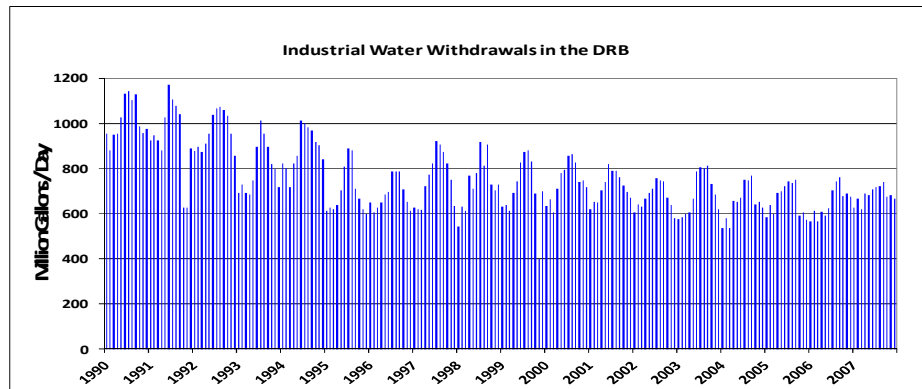


Figure 9. Industrial Withdrawals 1990-2007.

PBF-owned facilities are now fully operational. In April of 2012, Conoco Phillips sold its Trainer Refinery to Delta Airlines. Delta plans to convert the plant to jet fuel production to reduce its annual fuel expense. Finally, Sunoco merged with Energy Transfer Partners L.P. of Dallas in April of 2012, but the fate of Sunoco's Philadelphia and Marcus Hook Refineries remains uncertain. Sunoco is in talks to possibly run the Philadelphia refinery as a joint venture and Marcus Hook may end up being repurposed, possibly with a focus on natural gas. The full effect of additional demand of water for use in energy exploration, e.g., natural gas drilling, is as yet unknown.

### Seasonal Variation

The monthly data shown in Figures 7 through 9 highlight the extent to which water withdrawals and consumptive use vary seasonally. Thermoelectric power generation experiences peaks in the summer months that are related to the increased power demand for residential and commercial cooling. Simultaneously, public water suppliers experience peak demands in the summer months when lawn-watering and other outside uses are greatest. This highlights the need for including accurate seasonal (peak) considerations—including ecological (instream) needs—in long-range supply sufficiency assessments.

### Ecological (Instream) Flow Needs

Water supply planning in the basin generally has not taken into account the instream flow needs of aquatic communities principally due to a scarcity of specific quantitative information, especially regarding ecological flow relationship information. Understanding the instream flows necessary to protect key ecological communities for the range of habitats in the Delaware River Basin is vital for the Commission to effectively manage and plan to meet future water needs for all uses. In April 2012, the Commission and The Nature Conservancy (TNC) began a year-long study to develop basin-wide ecosystem flow recommendations that can be implemented within the subwatersheds of the Delaware River. The USGS WaterSMART study also includes an ecological flows component. Additional details on these projects and tasks for determining ecological flow needs and policy recommendations are part of Section 1.2.2 of the Work Program.

### Conditions in Special Groundwater Management Areas

Two areas of the Basin are included in special management programs to mitigate historical ground water supply issues and prevent future stress. The Commission manages the Southeast Pennsylvania Ground Water Protected Area (GWPA); New Jersey manages Critical Area 2 in the Potomac-Raritan-Magothy (PRM) aquifer system in southwestern New Jersey (Figure 10).

**New Jersey Critical Area 2.** NJDEP and USGS regularly monitor ground water levels in the affected aquifers of Critical Area 2 (CA2) in southern New Jersey and assessments indicate that withdrawals have significantly decreased beginning with the program's inception in 1996 (Figure 11) resulting in concurrent rebounding of ground water levels in most monitoring wells (Figure 12). However, although ground water levels have improved in general and appear to have stabilized, USGS synoptic data shows that some areas, just beyond CA2 boundaries, are showing declines.

Figure 10. Groundwater Management Areas in the Delaware River Basin.

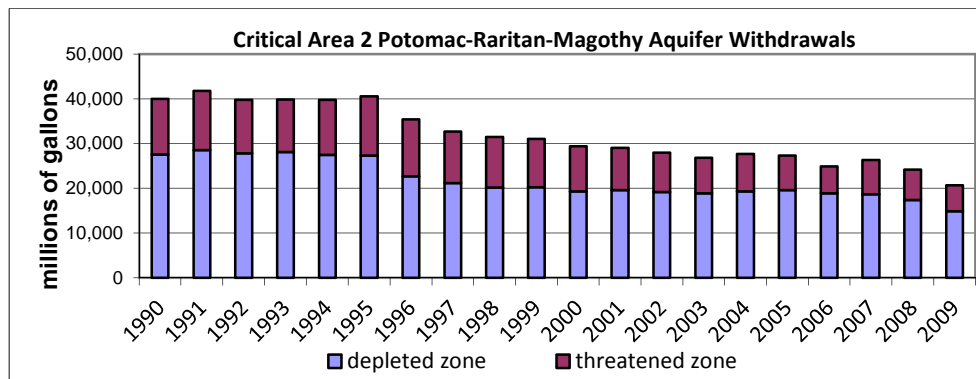
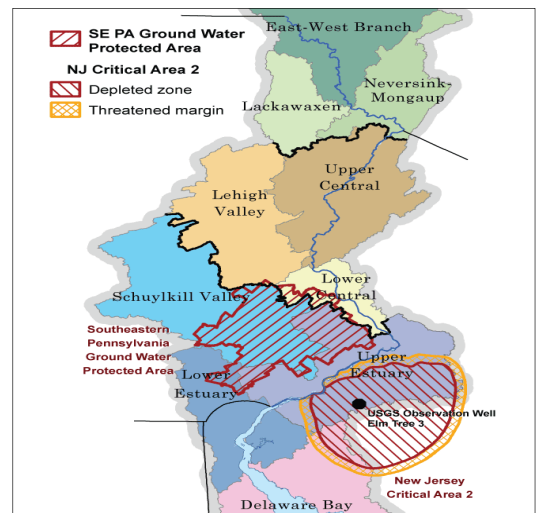


Figure 11. Withdrawals from the PRM 1990-2009 show significant reductions since the inception of Critical Area 2 management in 1996. Source: S. Domber, NJDEP, June 2012.

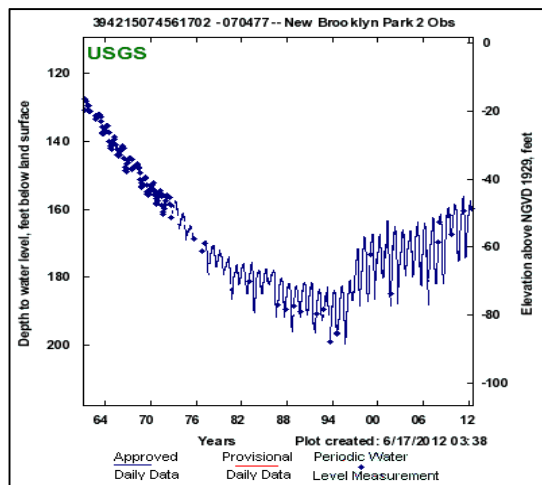


Figure 12. Example of rebounding groundwater levels in NJ Critical Area 2: New Brooklyn Park 2 observation well in Burlington Co. NJ. Source: A. Navoy, USGS. June 2012.

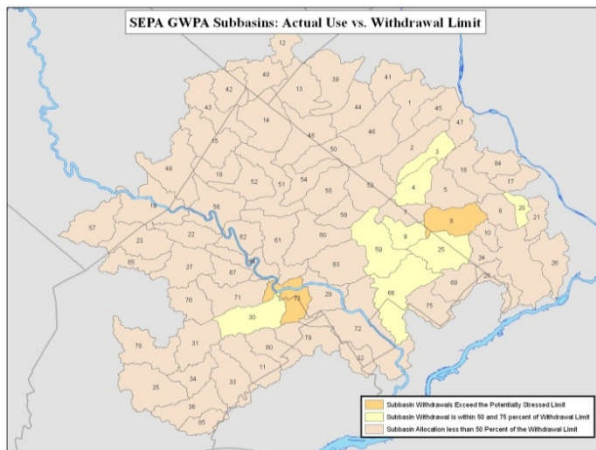
### Southeast Pennsylvania Groundwater Protected Area (SEPA GWPA)

The Southeastern Pennsylvania (SEPA) Ground Water Protected Area (GWPA) is an area of 76 sub-basins closely managed with regard to groundwater withdrawals, well interferences, and municipal water supply planning. Withdrawal limits have been established for each of the subbasins. Based on withdrawal data provided by the PADEP:

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- Use in ten (10) subbasins is currently greater than the fifty percent (50%) use level of their withdrawal limit.
- Use in two subbasins is greater than seventy-five percent (75%) of the subbasin's withdrawal limit, which is considered "potentially stressed" (See Figure 13).
- For any new withdrawal in a "potentially stressed" subbasin, GWPA regulations provide alternative programs geared toward increasing the groundwater recharge to the underlying formation or that conserve overall groundwater use.

A slight downward trend in groundwater withdrawals can be observed for the years of 2003 through 2008 as seen in Figure 14. This figure is based on groundwater withdrawal data provided by the PADEP (Chapter 110) from the years 2003 through 2008. The groundwater withdrawal data reported in the graph are from facilities that submitted data to the PADEP, which may not include all facilities in the GWPA.

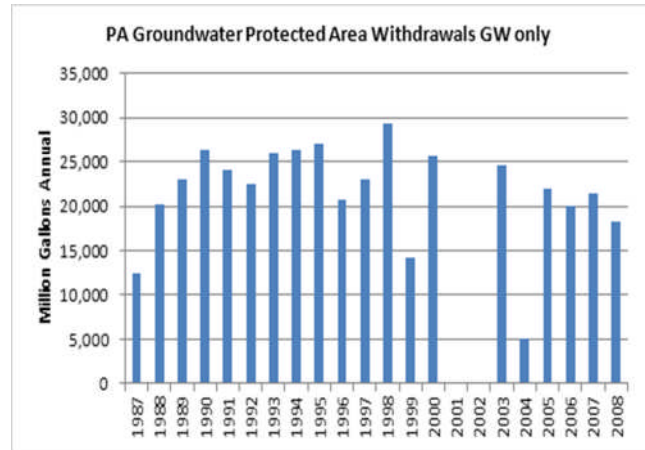


**Figure 13. Ten sub-basins (yellow) are currently above their 50% withdrawal limit and two sub-basins (orange) are above 75% of their limits, and considered potentially stressed.**

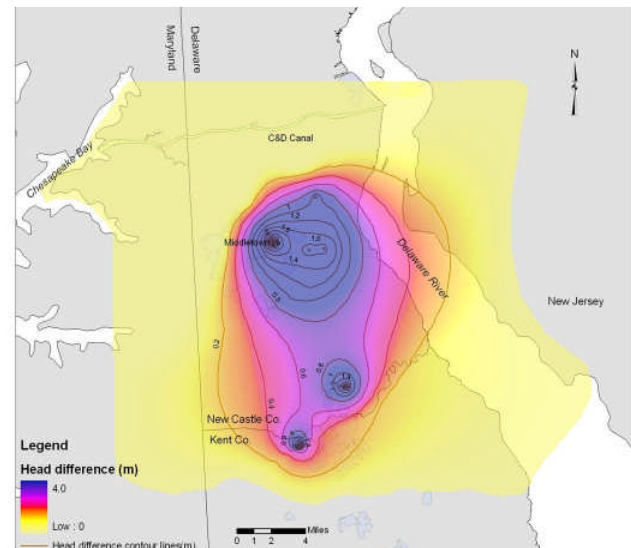
Presently, cumulative allocations in some subbasins exceed the recommended allocation limit. In order to plan for future development and an increased demand on groundwater resources, subbasin stress determinations will be made based on docket and SEPA GWPA permit allocations. The Commission will continue to update subbasin usage with current PADEP water withdrawal data and continue to lower cumulative docket/permit allocations to below their respective subbasin withdrawal limits. Additional tasks related to condition assessment and management of the SEPA GWPA are included in Section 1.0 of the Work Program.

### Areas of Concern: PRM & Bayshore Watersheds.

The 2007 report of a multi-year investigation by the USACE concluded that ground water withdrawals in northern New Castle County, Delaware, are reducing local stream base flows and forming cones of depression. Pumping in Delaware is increasing ground water flow from Maryland and decreasing flow into New Jersey



**Figure 14. Withdrawals in the PA Groundwater Protected Area 1987-2008 show reductions over the past decade.**



**Figure 15. Projected drawdown of Mt. Laurel aquifer in New Castle County, DE. Modified from He & Andres 2011, *Simulation of Groundwater Flow in Southern New Castle County DE*, DE DSG Report of Investigation 77. Source: S. Andres, DE DCNR, June 2012.**

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by about 10% each, and regional pumping has created overlapping cones of depression across the study area of the three states. This issue is currently being addressed by Delaware's Water Supply Coordinating Council (WSCC). Figure 15 shows the cone of depression and additional drawdown in the Mt. Laurel aquifer projected by 2030.

**Delaware.** Critical water resource issues in the Magothy, Mt. Laurel, Rancocas, Piney Point and Columbia aquifers of southern New Castle County and northern Kent County, Delaware, have driven a multi-year program in Delaware to improve groundwater monitoring and the collection of detailed, baseline hydrologic information to inform near-term (e.g. 10 year) management options. Multiple monitoring wells have been proposed for eight sites, as well as the re-activation of two USGS stream gaging stations. The project, begun in March 2012, includes well installation, monitoring, sample collection & analysis, and data assessment and is a collaborative effort of the Delaware Geological Survey, USGS, Delaware Department of Natural Resources and Environmental Control and the Governor's Water Supply Coordinating Council. The project will provide critical information on aquifer water quality conditions, yields, and pumping interactions to improve planning and provide management options for growing water demand in this region.

**New Jersey Beyond Critical Area 2.** NJDEP reports that significant demands for additional Potomac Raritan Magothy (PRM) aquifer water have materialized south of Critical Area 2 and based upon anticipated demands the impacts of all proposed diversions, could result in decreases in ground water levels and salt water intrusion—conditions that could warrant a Critical Area designation. Only limited allocations have been granted and further demands for potable water are being directed to the CA2 regional alternative while nonpotable demands should be met from reuse opportunities or sources other than the PRM<sup>4</sup>. A second area of concern in New Jersey is the Maurice River basin. According to NJDEP, USGS Scientific Investigations Report (SIR) 2005-5105 indicates that low flows in the Maurice River show a downward trend. Due to concerns about increasing demands for water from the Kirkwood-Cohansey aquifer and declining low flows in the Maurice River, the NJDEP commissioned a USGS study. USGS SIR 2005-5258 indicated that if existing allocations from the Kirkwood-Cohansey aquifer were fully utilized, base flow in the Maurice River at Norma, N.J. would see significant reductions. New Jersey has been denying applications for additional allocation from the Kirkwood-Cohansey aquifer upstream of Union Lake as the safe yield of the aquifer would be exceeded, and additional diversions would cause adverse impacts to stream flow<sup>5</sup>.

**Bayshore Supply Alternatives.** Few water supply alternatives exist for this area. Special consideration may be given to projects who can return a majority of their diversions to the upper Maurice basin. Attempts to develop alternative, non-critical, confined aquifers have been unsuccessful based on pump testing results where either the aquifer cannot sustain the pumpage (Piney Point, Mt. Laurel-Wenonah) or a lack of confinement in the aquifer exists (Atlantic City 800' sands), or water quality problems are evident (e.g., salt water in the Mt. Laurel-Wenonah). The NJ American Water Company's tri-county pipeline, originally developed as an alternative source of water for the stressed municipalities in Critical Area 2, has now been extended through much of Gloucester County, including Logan, Harrison, East Greenwich, Woolwich, Pitman and Elk Townships.<sup>6</sup>

### GENERAL STATEMENT OF BASIN SUPPLY SUFFICIENCY

Based on current and anticipated ground and surface water withdrawals, coupled with current operating restrictions (conservation releases, pass-by flows, consumptive use make-up, etc.) there is, in general, an adequate supply of water to meet both demand in the Basin and permitted exports from the Basin under normal conditions. Under medium risk conditions, e.g., 7-day average, one-in-ten-years (7Q10) low flow, demands can generally be met, except in a few sub-basins and select locations on the Schuylkill River. However, streamflow objectives and out-of-Basin diversions (Good Faith Agreement obligations) will not be simultaneously maintained during a recurrence of the 1960's drought<sup>7</sup>. Furthermore, groundwater in both NJ Critical Area 2 and the SE PA Groundwater Protected Area remains under close scrutiny and conjunctive use of surface water is both recommended and, in some locations, necessary. More in-depth analysis and investigation is needed to provide a detailed forecast of supply adequacy during a repeat of the drought of record, under modified operating restrictions, or under different climatic conditions. The Commission proposes over the next three years to prepare a supply assessment under various scenarios and make recommendations for a Sustainable Water Future through 2060 (see Water Supply Planning, Section II.B.1.1.).

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Recent studies by the US Army Corps of Engineers (USACE) have highlighted potential structural inadequacies due to age in the Blue Marsh and Beltzville reservoirs, issues that will need to be addressed to meet revised 30-year safety standards. Since water supply storage is used to maintain minimum flows at the dams as well as flow objectives on the Delaware River at Trenton, DRBC is responsible for annual debt service and a portion of operation and maintenance costs. These costs are customarily covered by the DRBC water supply charging program. Questions about the accuracy of the initial cost estimates as well as the adequacy of the current water supply charging program will be addressed through tasks in the Work Program for FY2014-2015. See Facility Planning Section II.B.4.2.

### C. WATER QUALITY

#### Water Quality Assessment

Two major water quality assessments, completed in 2012, together describe the water quality of the Delaware River Basin: the *Technical Report for the State of the Estuary / State of the Basin*, and the *2012 Delaware River and Bay Water Quality Assessment Report*. These two reports complement each other by utilizing different approaches to assess water quality.

**Table C1. Comparison of Water Quality Assessment Reports**

Comparison	Water Quality Technical Report for the State of the Estuary / State of the Basin	2012 Delaware River and Bay Water Quality Assessment
Evaluation Method	Use of Indicators	Compare observations to DRBC <u>Criteria</u>
Assessment	Current status, long term trends, future predictions	Supporting or not supporting
Term	10 year data window for current status, full period of record for long term trends	5 Year data window
Extent	Entire basin	Mainstem Delaware River only

#### ***Technical Report for the State of the Estuary / State of the Basin - Chapter 3: Water Quality.***

This report provided an assessment of water quality indicators for the entire basin, with special emphasis on the estuary. The technical report differed from, and complemented the Water Quality Assessment Report, in that it focused on metrics for which no criteria have been developed and evaluated long term trends. The Water Quality Technical Report--Chapter 3 of the Technical Report for the State of the Estuary and Basin (TREB) - is available at: [www.delawareestuary.org/pdf/TREB/Chap3.pdf](http://www.delawareestuary.org/pdf/TREB/Chap3.pdf). DRBC staff prepared all or portions of several chapters of the TREB including 1, 2, 3, and 5. The full TREB report is available at: [www.delawareestuary.org/technical-report-delaware-estuary-basin](http://www.delawareestuary.org/technical-report-delaware-estuary-basin)

#### ***2012 Delaware River and Bay Water Quality Assessment.***

The Water Quality Assessment (previously called the Integrated Assessment) performed by DRBC focuses on the mainstem Delaware River, comparing observations to water quality criteria to determine whether water quality is sufficient to support designated uses. Designated uses for the River include: Aquatic life, Public Water Supply, Recreation, Fish Consumption and Shellfish Consumption, although not all uses are designated in all water quality zones. Assessments completed in 2012 to determine support of the designated uses of the Delaware River are reported in the 2012 Delaware River and Bay Water Quality Assessment at [www.nj.gov/drbc/quality/reports/quality/index.html](http://www.nj.gov/drbc/quality/reports/quality/index.html).

### **GENERAL STATEMENT OF BASIN WATER QUALITY**

Overall, water quality in the Delaware River and Bay is good, with the majority of observations meeting criteria. Meaningful assessment was hampered, however, by current guidance from EPA. EPA indicated that assessment agencies must indicate an assessment unit as having not met criteria when one exceedance plus one confirmatory exceedance are found. However, this approach is not supportable because it does not recognize inherent measurement and analytical uncertainty, and imposes a different standard than that which was in place at the time the criteria were developed. As a result, many uses



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were indicated as “not supported”, even where the vast majority of observations met water quality standards. The summaries by designated use, below, provide insights gained from the two assessment efforts. Recommendations for future actions to improve water quality assessment efforts and plans for monitoring and modeling are included in Determining Water Quality and Meeting Standards Section II.B.1.4.

**Aquatic Life.** Support of the aquatic life designated use is assessed by evaluation of dissolved oxygen, pH, turbidity, temperature, TDS, alkalinity, toxic pollutants, and biology. The majority of observations met water quality standards, with the following exceptions:

- **pH** - criteria were mostly met, with the exception of Zone 1E, where daily pH maximum values routinely exceeded the maximum criterion of 8.5.
- **Turbidity** - In previous assessment cycles, only spot measurements were available for turbidity assessment in Zone 5. In April 2009, USGS added turbidity to the monitor at Reedy Island Jetty (01482800). In reviewing these data, it became clear that turbidity in Zone 5 is largely not meeting criteria. In fact, no rolling 30-day mean during the data period met the 30-day mean criteria, and only 37% of observation days met the instantaneous maximum criteria. However, this mismatch between measured turbidity and criteria may indicate a problem with the criteria rather than a water pollution problem. Zone 5 of the estuary spans the well documented estuary turbidity maximum (ETM) for the Delaware. ETM's are naturally occurring features of most estuaries, and typically occur near the toe of the salt wedge. Again, however, it is unclear how anthropogenic drivers, such as vessel traffic and dredging impact the natural turbidity regime in the ETM, and what level of turbidity supports an aquatic life use.
- **Temperature** - As noted in previous assessments, temperature criteria in Zones 1A through 1E are clearly oriented toward determining compliance of thermal mixing zones for point discharges. Currently, DRBC has no ambient surface water temperature standards in Zones 1A through 1E. DRBC continues work on development of ambient temperature criteria in the non-tidal river, as well as clarifying language regarding the application of the existing criteria.
  - As also noted in previous assessments, atmospheric temperatures and meteorological conditions are strong drivers of water temperature. DRBC previously demonstrated that water temperatures are strongly linked to air temperatures, and that a notable increase in air temperatures is observable between the temperature gradient period (1961-1966) and the current period. At present, we lack the tools to determine which portion of the exceedance is attributable to potentially controllable anthropogenic thermal inputs, and which portion is due to meteorological drivers beyond our control.
- **Copper** - Data showed exceedances of DRBC acute marine stream quality objective for copper in Zones 5 and 6 as well as exceedances of the DRBC chronic freshwater stream quality objective for copper in Zone 5.
  - Assessment of metals in ambient water is complicated by factors such as field sampling and analytical issues with contamination, the applicability of DRBC's freshwater or marine criteria, and the influence of other water quality attributes that influence the partitioning and toxicity of copper. The DRBC collected additional data using enhanced analytical methods, modified collection procedures and changes in the spatial scale of sampling in segments of the Delaware River which have exhibited apparent copper exceedances. The information collected will provide additional data to determine metal concentrations in ambient water and the impact of metals on water quality. The survey targets copper, zinc and nickel. Coordination among basin states and agencies should continue to ensure the use of the most appropriate methods and procedures for the conduct of monitoring studies in the Basin, and the harmonization of water quality criteria and assessment methodologies.
- **Methylmercury** – No exceedances were observed in the fish species monitored by the DRBC in tidal (Zones 2-5) and non-tidal (Zone 1) waters for channel catfish, white perch, smallmouth bass and white sucker. State data showed exceedances of DRBC stream quality objectives for methylmercury in Zones 5 and 6. The methylmercury criterion is fish tissue residue based as recommended by USEPA.
  - DNREC database includes Atlantic croaker, tautog, and striped bass with exceedances for striped bass in Zones 5 and 6

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- PADEP's fish tissue database showed exceedances of EPA water quality criteria based on fish tissue residue for methylmercury in smallmouth bass and American eel for Zones 1C and 1D.
- **Cadmium & Aluminum** - Data showed exceedances in Zone 1B of EPA-recommended acute criteria for cadmium, and exceedances in Zones 1A, 1B and 1D of EPA-recommended chronic criteria for aluminum. DRBC does not have stream quality objectives for these metals.
- **Bioassessment** - In Zone 1E 41% of invertebrate samples fell below the impairment threshold. Therefore, Zone 1E is indicated as impaired using biological data for the assessment period.

**Public Water Supply.** Support of the Public Water Supply designated use is assessed by evaluation TDS, Hardness, Chlorides, Odor, Phenols, Sodium, Turbidity, Systemic Toxicants, Carcinogens, and Drinking Water Closures. The majority of observations met water quality standards for Public Water Supply.

**Recreation.** Primary and secondary contact uses were supported in all applicable Zones, except for the lower portion of Zone 4, where insufficient data were available.

**Fish Consumption.** Support of the Fish Consumption designated use is assessed primarily by the presence of the Basin States' fish consumption advisories in the mainstem Delaware River and Bay for the 2010 to 2011 assessment period. The presence of fish consumption advisories results in an assessment of "not supporting the designated use". For each assessment unit, between 2 and 8 advisories were issued. There is no assessment unit without an advisory, so the use is not supported in any zone.

**Shellfish Consumption.** Shellfish consumption, as a DRBC designated use, only applies to DRBC WQM Zone 6. For the current 2012 assessment, approved harvesting areas were considered to be supporting the use. Prohibited waters were considered to be not supporting the use. Assessment units classified as special restricted and seasonally restricted are considered to be supported, but with special conditions. In total for the 2012 assessment, 637 mi<sup>2</sup> are in full support (90% of Zone 6), 33 mi<sup>2</sup> are supporting with special conditions (5%), and 40 mi<sup>2</sup> are not supporting the shellfish consumption use (5%).

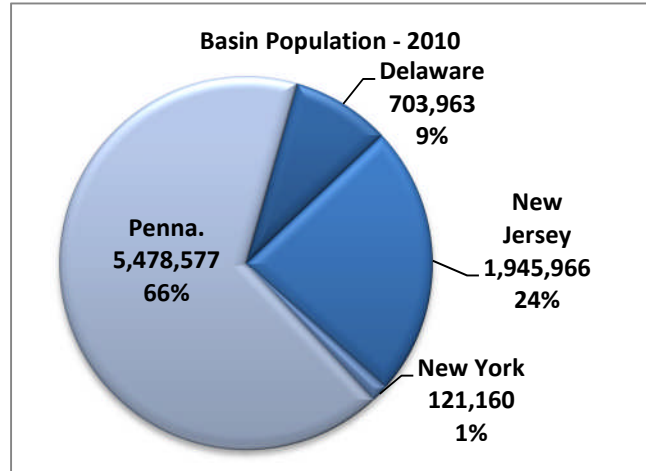
### **Antidegradation: DRBC Special Protection Waters.**

DRBC has finished 3-5 years of water quality monitoring in the Special Protection Waters and is currently assessing the data to determine if the management goal of "no measurable change to existing water quality is being attained."

#### D. POPULATION & LANDSCAPE

The following statistics are based on the 2010 US Census:

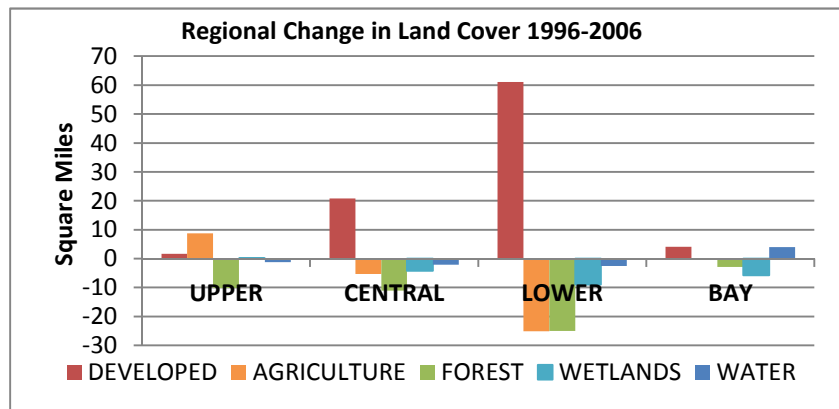
- The population (Figure 16) of the basin has increased by nearly one half million people from 7.76 million in 2000 to nearly 8.26 million in 2010, (491,217 or 6.3%).
- If compared with the fifty states, the basin would now rank 11<sup>th</sup>, behind New Jersey and ahead of Virginia.
- Density increased to 646 persons per square mile in 2010 from 608 persons per square mile in 2000.
- The resources of the basin support nearly 3.5 million jobs.
- Continued population growth at 6.3% per decade will mean an increase of 35.7% to 11.2 million people by the planning horizon of 2060.
- The greatest concentration of developed area (and population density) is the Lower Region of the basin - the greater Philadelphia-Camden-Wilmington area.



**Figure 16. Basin Population 2010.** Pennsylvania accounts for approximately two-thirds of the basin's population. Note: An additional 8 million people outside of the basin who rely on basin water supplies are not included in this figure.

Landscape change occurs incrementally, but is nonetheless worth tracking, since landscape conditions affect water resources. In the decade between 1996 and 2006, the landscape has changed, although in the aggregate not dramatically. Net changes are summarized below and regional shifts in land cover are illustrated in Figure 17:

- Developed land covers almost 15% of the basin and increased by nearly 88 square miles (approximately one acre for every 9 additional people).
- Natural landscapes (e.g., forests, wetlands) cover slightly less than 60% of the landscape, and decreased by 70 square miles from 1996 to 2006. Forested land, once a dominant feature, now accounts for less than half of the basin land cover. Continued loss of forest and wetlands, both crucial to sustaining water quality and availability, could have a negative impact on the long term condition of the basin's water resources.



**Figure 17. Regional Net Change in Land Cover 1996-2006** illustrates the magnitude of change and the net gains/losses in land cover in the four basin regions. Forest loss was experienced across the basin. Based on analysis of satellite imagery from NOAA Coastal Services Center.

- Wetlands loss continues, although at a rate greatly reduced from historic rates. Coastal wetlands face the threat of inundation from rising sea levels exacerbated by an inability to migrate inland where trapped by existing developed land.
- Cultivated (agricultural) land also experienced a net decrease during the decade.



## **DRBC Water Resources Program FY 2014-2016**

Estimates of future population will drive both direct (potable supply) and indirect (energy-related, industrial needs) for water. Estimates of future land use/land cover and its implications for future water supply needs will be developed as part of the USGS National WaterSMART program and integrated into the Sustainable Water Future 2060 project. See Section II.B.1.1 of the Water Resource Work Program. Detailed, high resolution (1m) mapping of forested land cover in the upper basin watersheds is being undertaken as part of the Natural Gas Development Plan review process.

### **E. EMERGENT ISSUES**

#### **Natural Gas Extraction in the Upper Basin**

Explorative and extractive drilling for natural gas in the Marcellus Shale and other formations in the Delaware River Basin are activities that could adversely affect or stress water resources. The Commissioners have determined that no Commission approvals will be granted for water withdrawal or Natural Gas wells in the Basin until the Commission issues final regulations regarding the matter. As the interest in natural gas development continues to increase, it is important that extraction and related activities be conducted in a way to minimize impacts to water resources. Current extraction methods offer technology (i.e., horizontal drilling) that provides for more economic access to gas resources while minimizing landscape disturbances. However, the new technology requires large amounts of fresh water to fracture the formation to release the natural gas. A significant amount of water used in the extraction process is recovered, but this "frac water" includes natural gas and chemicals added to facilitate the extraction process, as well as brine and other contaminants released from the formation. The amount of landscape alteration that will occur is the subject of much research and analysis, and the Commission remains committed to protecting the high value water resource landscapes which are critical for the maintenance of high water quality in the Wild and Scenic portion of the Delaware River. Work Program tasks related to natural gas activity are found in Special Section II. B. following Section II.A. Key Issues.

#### **Energy Issues**

Energy generation and transmission also introduce the potential for impacts to water resources. Among the projects that are under observation by DRBC are:

- proposed natural gas and power transmission lines that cross the River corridor
- the transition from once-through to evaporative cooling as existing or new power stations add capacity
- additional nuclear generating stations proposed within the DRB that will require a substantial volume of water for evaporative cooling.

#### **Changing Climate and Adaptive Management**

There is potential for significant changes to water resources in the Basin due to global changes in climate and shifting regional weather patterns. At this point, however, uncertainty is high, and tools are not readily available to accurately predict the extent of prospective changes. While the science continues to evolve, several climate models predict that basin temperatures will increase, precipitation will stay the same or increase, and sea level will rise between 0.5m and 1m by 2100. Precipitation is predicted to occur in the form of fewer, more intense storms occurring in the winter months. This means a potential increase in flood events coupled with extended drought cycles. Increased temperatures will affect evapotranspiration rates and stream water quality. Turbidity levels will likely increase and dissolved oxygen levels decrease. Sea level rise may require increased releases from storage to augment river flows to repel salinity and/or costly modifications by water suppliers to treat increases in dissolved solids. Changes in seasonal flows, e.g., the timing of spring snow melt, could negatively affect migratory as well as resident species and increase opportunities for invasive species.

Work Program tasks related to the impacts of climate change and adaptive water management planning are integrated as appropriate in relevant sections, especially Water Supply Strategy: Forecasting and Planning, Section II.B.1.1.

## **II. WATER RESOURCE MANAGEMENT PROGRAM**

### **Summary of the activities and programs constituting the work plan for FY 2014-2016**

#### **A. KEY ISSUES AND PRIORITIES**

In the evaluation of work priorities over the next three years, an overarching goal of the Commission is to implement Integrated Water Resource Management (IWRM) by using rigorous science (monitoring, assessment and modeling) as the foundation for reasonable and effective long-range planning and regulatory programs. Risk management, including the incorporation of judicious assumptions for the effects of changeable climate conditions, will be a focus, as well as efficiency and value in program implementation. Accordingly, key issues include:

- Ensuring water supply sufficiency for human (off-stream) and ecological (in-stream) needs
- Ensuring suitable water quality in shared waters and developing appropriate stream quality objectives
- Reducing or avoiding impacts from droughts
- Reducing or avoiding impacts from floods
- Identifying and implementing the responsibility among agencies for advancing shared water management objectives
- Ensuring natural gas development activities are conducted in a manner that is consistent with the above.

#### **COMMISSION PRIORITIES**

##### **1. Water Resource Management Priorities**

- Analyze, report and provide technical support for flow management decisions
- Develop models and other assessment tools critical to inform planning and management decisions for water quality, water supply, drought forecasting, natural gas development activities, ecological flows, etc.
- Plan to meet the long-range water supply needs of the Basin
  - Monitor the quantity and use of the basin's waters
  - Assess the needs related to water supply, including the evaluation of ecological flow recommendations
- Monitor water quality to support anti-degradation and criteria-based programs
- Flood Mitigation – Improve our knowledge and tools for evaluating the risks associated with floods and develop a Flood Risk Management Plan that builds upon the recommendations of Interstate Flood Mitigation Task Force.

##### **2. Regulatory Priorities**

- Transition to single coordinated wastewater discharge permitting focused on state NPDES programs
- Evaluate and update standards: revise rules for pH, and temperature; gather information on and develop a management approach for nutrients; review designated use & associated criteria (Zones 3, 4, 5); update existing water quality (EWQ) metrics for Upper and Middle Delaware; manage PCBs in the tidal River
- Maintain existing high water quality in Special Protections Waters
- Adopt appropriately protective Natural Gas Regulations to complement state regulations
- Develop a nutrient evaluation and reduction plan utilizing lessons learned from the PCB TMDL.
- Update Administrative Agreements (AAs) with states
  - Regulate and coordinate water withdrawals in accordance with AAs
  - Regulate and coordinate wastewater discharges in accordance with AAs

### **DRBC Water Resources Program FY 2014-2016**

- Public participation in the adoption of new AA decision making framework
- Update Rules of Practice and Procedure (RPP) as appropriate
- Update Water Code to reflect framework and high level requirements of the Decree Party Flexible Flow Management Program
- Develop instream flow implementation policy based on recommendations from The Nature Conservancy project
- Supplemental Table A provides a general summary of rule and administrative activity through FY2016

### **3. Organizational Stability**

- Develop sustainable funding streams to ensure the long term viability of the Commission

## **DRBC Water Resources Program FY 2014-2016**

### **B. WATER RESOURCE MANAGEMENT WORK PROGRAM**

#### **SPECIAL SECTION: NATURAL GAS DEVELOPMENT IN THE DELAWARE RIVER BASIN**

1. Adoption of Regulations
2. Comment and Response Document
3. Online Application Development
4. Guidance Materials
5. Natural Gas Development Plan Decision Support Tool
6. Legal Challenges
7. Program Implementation

##### **1. Adoption of Natural Gas Development Regulations**

Based on Commissioner feedback, staff will continue to review and revise as necessary the draft Natural Gas Regulations published on November 8, 2011. Staff will provide support to the process leading up to the approval of the Regulations by the Commissioners.

##### **2. Comment and Response Document**

Staff will prepare a Comment and Response Document that addresses public comments made on the draft Natural Gas Regulations.

##### **3. Online Application Development**

Staff will develop online application forms for natural gas related projects. The Natural Gas Application and Reporting Program will be developed to include online application forms, integrated database, electronic deliverables, database security, standard operating procedures and training.

##### **4. Guidance Materials**

Staff will prepare guidance materials necessary for the implementation of the natural gas regulations. Guidance documents are planned for natural gas development plans, water and wastewater accounting, monitoring, treatability studies, financial assurance, fracture chemical disclosure, and post-hydrofracture reporting.

##### **5. Natural Gas Development Plan Decision Support Tool**

Staff will complete the development of a GIS based Decision Support Tool (DST) with the support of a \$650,000 grant from the William Penn Foundation. Staff and contractors will complete the preparation and/or acquisition of GIS base layers of restricted areas as well as those for high-value water resource landscapes for inclusion in the DST. The DST will enable applicants, the public and Commission staff to develop and/or evaluate proposed natural gas development plans. GIS data acquisition includes a detailed land cover raster data set from the University of Vermont's Spatial Analysis Laboratory (UVM-SAL). UVM-SAL is utilizing high resolution imagery from the National Agriculture Imagery Program and Light Detection and Ranging (LiDAR) data sets to prepare a high resolution land cover for portions of the 8 county headwaters region. Forest cover will be delineated with greater than 90% accuracy. The USGS has also been contracted to establish first and second order stream catchments (headwaters) in the portion of the Basin underlain by Marcellus Shale. The DST will be accessed through a web portal and base data layers will be made publically available to inform a variety of planning activities.

##### **6. Legal Challenges**

Staff will continue to defend legal challenges brought forth against the Commission associated with the adoption of Natural Gas Regulations.

##### **7. Program Implementation**

Once Regulations are adopted, staff will implement the program using the tools prepared, including online applications, guidance materials, and the Decision Support Tool for Natural Gas Development Plans (NGDP).

**DRBC Water Resources Program FY 2014-2016****DRBC WATER RESOURCES PROGRAM  
NATURAL GAS REGULATIONS**

<b>Program/Project</b>	<b>Products/Outputs</b>	<b>Fiscal Year</b>	<b>Funding Sources</b>
Natural Gas Development	Adopt Regulations	2014-2015	General Fund
	Comment & Response Document	2014-2015	General Fund
	Online Applications	2014-2015	General Fund
	Guidance Materials	2014-2015	General Fund
	Program Implementation	2014-2016	Review Fees
Natural Gas Development Plan (NGDP) Tool	GIS data acquisition (USGS, UVM)	2014	William Penn Foundation
	Forest cover mitigation and site restoration recommendations	2014	William Penn Foundation
	Web portal development	2014-2015	William Penn Foundation
Natural Gas Development – Legal	Defend Commission interests in legal proceedings	2014-2016	General Fund

## DRBC Water Resources Program FY 2014-2016

### **Section 1.0 ENSURING THE SUSTAINABLE SUPPLY OF SUITABLE QUALITY WATER**

- 1.1 Water Supply Strategy: Forecasting and Planning
- 1.2 Multi-objective Flow Management
- 1.3 Water Supply Management: Conservation, Permitting and Special Area Administration
- 1.4 Determining Water Quality & Meeting Standards: Criteria-Based Programs, Anti-Degradation, Water Quality Administration

#### **1.1 WATER SUPPLY STRATEGY: FORECASTING AND PLANNING**

##### **1.1.1. Water Supply Planning for a Sustainable Water Future 2060**

Building on the water use and demand evaluation work in past reporting efforts—e.g. USGS/DRBC Selected Water Budgets (2005) and Estimated Groundwater Availability (2006), the US Army Corps of Engineers (ACOE) Multi-Jurisdictional Study 2008, State water supply plans, DRBC Key Sector Trend Analyses (2010-2011)—and in partnership with USGS, the Commission will integrate efforts to prepare a detailed and comprehensive analysis of water demand, availability and sufficiency through 2060. Past analyses, as well as recent condition reporting (see Conditions Section I of this Program) have identified areas where stress is evident and investigations will be done to identify additional areas of concern. Assessment of surface flows, aquifer conditions, anthropogenic supply needs, permitted allocations, and ecological needs, will be connected to identify long-term sustainability concerns and suggest appropriate remedies. Existing models will be employed and/or improved to aid with the assessment and determine areas where additional storage may be needed for flow augmentation.

The work plan will include:

- water demand projections associated with thermoelectric power generation and other energy production and exploration
- analysis of the first mandatory water audits from calendar year 2012 and recommendations for future actions
- assessment of improved current and comprehensive water use records across all sectors
- improved estimates of instream flow needs for key ecological communities within the DRB
- review of thresholds, including the adequacy of the drought of the 1960's as the Basin's drought planning benchmark
- identification of additional information and tools necessary to forecast future condition (demand, supply, climate) scenarios
- ongoing assessment of special groundwater management areas within the Basin
- consideration of need for groundwater withdrawal limits in additional areas of groundwater stress
- adequacy of supply storage facilities to meet future in-stream and off-stream needs.

While most tasks are included in Section 1.1 of the work program, others—those related to flow modeling or agency coordination, for example - are described in other sections of the document as appropriate.

The Delaware River Basin was selected as one of three focus areas nationwide to be included in the WaterSMART<sup>8</sup> (Sustain and Manage America's Resources for Tomorrow) program. Program products include:

1. Acquisition, management, and integration of water-use and water-supply data
2. Development of ecological-flow science including enhancement of the existing Decision Support System for parts of the Delaware River and development of a streamflow estimation tool for ungaged sites
3. Development of a hydrologic watershed model to evaluate water stressors such as growth of population centers, the effects of land-use change, and the effects of climate variability and climate change on water resources in the basin.

The results of the USGS WaterSMART DRB focus area study will contribute significantly to the information needs of the DRBC's Sustainable Water Future planning

##### **1.1.2. Supporting State Water Supply Planning and Allocation**

DRBC works closely with the states through the DRBC Water Management Advisory Committee and by serving on committees organized by the states for water supply planning and management. This coordination and collaboration will continue. All states, and most recently New York, have stepped up

## **DRBC Water Resources Program FY 2014-2016**

data collection efforts which are critical for well-informed planning and management. Approaches used in state planning programs, including median and low flow thresholds, infrastructure capacity, etc., will be considered as DRBC develops scenarios for Sustainable Water Future 2060.

As reflected in the updated administrative agreements between the Commission and the states of New Jersey (2009) and Delaware (2010), the Commission is relying upon the state permitting/allocation programs for a majority of the groundwater and surface water withdrawals in those states. Updates to administrative agreements with New York and Pennsylvania are scheduled for FY 2014. DRBC administers a special program for the Southeastern Pennsylvania Groundwater Protected Area (SEPA-GWPA, see section 1.3.2). New York's water supply law (see primarily ECL article 15 titles 15, 16 and 33) was amended on August 16, 2011 (Laws of New York, Chapter 401), with most of the statutory amendments effective as of February 15, 2012. The amendments expand the permit program to include withdrawals for purposes beyond public water supply, such as those for commercial, manufacturing, industrial, and other purposes, and also limit the permit program to only include systems with capacity to withdraw 100,000 gallons per day or more. Previously, permits were required for any volume of withdrawals for public supply. The revised rule indicates that since the NYSDEC, as a voting member of the DRBC, is integrally involved with the DRBC's water withdrawal approval processes, that if a water withdrawal occurs in the jurisdiction of the DRBC and the water withdrawal is approved by DRBC, as applicable, then the water withdrawal is exempt from the permit requirements of the rule. Additionally, the DRBC approval processes have provisions for including requirements from host states, which may include New York's pass-by flow requirements, as applicable, permit conditions, and regulations, including HVHF drilling regulations. With these revisions, New York's program now will be similar to that of the other Basin states. Note: Identification of problem areas and ongoing state efforts to address them are reported under Section I: Conditions. DRBC participates in Delaware and New Jersey water supply planning efforts through respective state advisory councils.

### **1.1.3. Surface Water Charging Program**

DRBC administers an ongoing Surface Water Charging Program, which includes new on-line registration capabilities, database management, invoicing and accounting. A study of the sufficiency of this program is included with the evaluation of the future maintenance and replacement costs associated with Beltzville and Blue Marsh reservoirs discussed in Facility Planning, 1.1.4.

### **1.1.4. Facility Planning**

The Commission has considerable powers of oversight relating to major facilities and projects affecting water resources in the basin, and..."for the determination of project priorities, pursuant to the requirements of the comprehensive plan and [the] water resources program."

A draft list of major projects, including reservoir enhancement options, has been assembled for evaluation against the current need for supply and regional flood control. One principal need for this is to be responsive to future flow augmentation needs as diversions from the upper basin are maximized (see below). This list will be evaluated against demand projections and storage needs as part of the Sustainable Water Future 2060 program (Section 1.1.1.). An updated list of facility needs will ultimately be incorporated into the Comprehensive Plan.

The Commission will focus on several aspects of facility planning in the next three years:

- a) Evaluation of needed repairs to Blue Marsh and Beltzville reservoirs
- b) Adequacy of the current water supply charging program to meet fiscal responsibility for reservoir operations and maintenance
- c) Review of basin-wide storage capacity and ability to meet projected in-stream flow and off-stream supply needs.

**1.1.4.A. Beltzville and Blue Marsh Reservoirs.** The Commission owns water supply storage in two federal reservoirs—Beltzville (Lehigh River Watershed) and Blue Marsh (Schuylkill River Watershed)—and is responsible for their annual debt service and a portion of their operation and maintenance costs. On May 8, 2012, the Commission issued a Request for Proposal and Quotation (RFPQ) for consulting services to estimate the future replacement and maintenance costs for the two reservoirs (phase 1) as well as to evaluate the associated surface water charging program and fund (phase 2). Commission staff will manage the two phased contract, which is expected to last between 12 and 15 months upon contract

## DRBC Water Resources Program FY 2014-2016

award. In addition, to support these endeavors, the Water Charging Advisory Committee (WCAC) was formed and will advise the Commissioners regularly throughout the project. See also Section 4.4.2. Internal Advisory Committees.

**1.1.4.B. Water Supply Charging Evaluation.** To advise the Executive Director on matters relating to existing and potential changes to the Commission's water charging program and rates, including review of the RFPs and resulting studies as described in 1.1.4.A. above, the Commission has assembled a Water Charging Advisory Committee (WCAC). The review of the program and duration of the WCAC is projected for two years.

**1.1.4.C. Storage Capacity Adequacy and Options.** Review of the volume and adequacy of basin-wide storage capacity is part of the Water Supply Planning for a Sustainable Water Future Section 1.1.1.

### DRBC WATER RESOURCES PROGRAM 1.1. WATER SUPPLY STRATEGY

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
Sustainable Water Future	Work plan for Sustainable Water Supply 2060 Strategy	2014	General Fund
	Evaluation of basin-wide & regional water use, projections of future needs, supply alternatives	2014-2016	
	Coordination with state and federal evaluations of water supply and instream flow needs	2014-2016	
	Modeling to aid with the assessment and to determine areas where additional storage may be needed for flow augmentation	2015-2016	
	Strategies for supply sufficiency through 2060	2016	
Support of State Programs	Coordination and support of basin state water supply programs	2014-2016	General Fund
Surface Water Charging Program	Program administration, database management, invoicing	2014-2016	General Fund
Facility Planning	Updated list and description of Water Supply Enhancement Options	2014-2016	General Fund
	Updated Water Supply Facilities section in CP	2014-2016	General Fund
	Investigation of 30-year capital replacement & maintenance costs for multi-use reservoirs & recommendations	2014-2015	General Fund
Water Supply Storage Fund	Study of adequacy of surface water charging program & recommendations	2014-2016	General Fund



## **1.2 MULTI-OBJECTIVE FLOW MANAGEMENT**

The main stem of the Delaware River is the longest un-dammed river east of the Mississippi. However, there are dams on several large tributaries that store water in reservoirs and regulate flow to the river through conservation releases, and also provide flood control, water supply, and instream flow augmentation. In addition to varying precipitation patterns, activities that affect instream flows include: releases, diversions and outflows from water supply and multipurpose reservoirs on tributaries, interbasin water transfers from tributaries and the river, and water withdrawals from interconnected ground water sources. Low flows may impact ecosystems and reduce the assimilative capacity of the river for wastewater discharges. High flows may cause loss of life and property as well as move sediment and alter the river morphology, riparian corridor and habitat for aquatic populations.

### **1.2.1. Reservoir Operations**

On May 31, 2012, New York State, Pennsylvania, New Jersey, Delaware, and the City of New York signed a one-year agreement for a new interim flow program intended to protect fisheries habitat downstream of the New York City (NYC)-Delaware Basin reservoirs, enhance flood mitigation, and repel the upstream movement of salt water in the Delaware Estuary. This new agreement, which is in effect from June 1, 2012 through May 31, 2013, uses release rates patterned after recommendations provided in a January 2010 joint fisheries paper from the New York State Department of Environmental Conservation and the Pennsylvania Fish and Boat Commission. Once a longer term FFMP is negotiated, the Water Code will be modified to reflect it. In addition, the rates at larger storage volumes create a higher potential to achieve a 10 percent storage void in the reservoirs between September 1 and March 15. This program may help mitigate river flooding during periods of high inflows and snow melt. The program makes use of the City's new Operations Support Tool (OST). The OST, a sophisticated monitoring and modeling system that NYC Department of Environmental Protection is developing, will enable the Decree Parties (four basin states and NYC) to better manage the use of water from the reservoir system and the Delaware River Basin. This new tool allows better prediction of reservoir-specific water storage levels, quality, and inflows, which will guide selection of releases from the three reservoirs to the Delaware River. Tasks related to the evaluation of future replacement and maintenance costs for Beltsville and Blue Marsh reservoirs are described in Section 1.1.4. Facility Planning.

### **1.2.2. Ecological Flows**

Several initiatives are underway to better identify the ecological flow needs of the Basin.

#### **1.2.2.A. Non-tidal mainstem & Tributaries**

- In April 2012, the Commission and The Nature Conservancy (TNC) began a study to develop basin-wide ecosystem flow recommendations that can be implemented within the subwatersheds of the Delaware River (Management Step 1). The study area will focus on all tributary rivers and streams in the Appalachian Plateau, Ridge and Valley, New England, and Piedmont Physiographic Provinces, but will not include the streams of the Coastal Plain Physiographic Province. The project will also summarize information about flow-sensitive species, communities, and ecological processes for the non-tidal mainstem Delaware River as far downstream as Trenton. The resultant recommendations would be a key component in a subsequent policy development process for in-stream flow requirements (Management Step 2). Such a policy could address pass-by requirements for water withdrawals, conservation release requirements for reservoirs, consumptive use mitigation triggers and flow targets. The recommendations may also help the Commission and other Basin partners in the planning, design (location and size) and operation of future water supply storage facilities.
- A complementary project for instream flows is also part of the USGS's 3 year WaterSMART study for the Delaware River Basin. In 2002, the United States Congress directed the USGS to produce a report describing the scope and magnitude of the efforts needed to provide periodic assessments of the status and trends in the availability and use of freshwater resources. As part of its Water SMART initiative (see reference in Section 1.1.1), USGS proposes to support ecological flow science in tributaries by developing a method to estimate daily mean flows for all ungaged streams in the DRB, aggregate biological data (i.e., fish and invertebrates) for the DRB, and define relations between streamflow processes and aquatic ecosystem response. To support ecological flow science for the main-stem Delaware River, USGS proposed to update and

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enhance an existing Decision Support System (DSS) to accurately predict flow-habitat relationships downstream of the New York City's reservoirs. The DSS would be updated and enhanced to improve accuracy of predicted flow habitat relations and increase user friendliness and transparency of calculations. In addition, additional species of interest would be added and the DSS's modeled domain would be extended to include a larger portion of the Delaware System.

- The Subcommittee on Ecological Flows (SEF) of the Regulated Flow Advisory Committee (RFAC) continues to provide reviews and guidance on the ecological needs of the upper mainstem Delaware River in terms of timing, amounts, and rates-of-change for flow releases from Upper Basin reservoirs, including the temperature thresholds for maintaining a robust cold water fishery. Extensive research by the USGS continues on the environmental requirements and environmental setting of the endangered Dwarf Wedgemussel (DWM) populations of the upper mainstem and tributaries. The research results, in part, will be included in updated revisions to the USGS Decision Support System (DSS) model for the upper mainstem and three of its primary tributaries, with initial revisions becoming available in 2013 (see USGS WaterSmart above).

### 1.2.2.B. Estuary

Freshwater inflow requirements for estuary populations, such as oysters and Atlantic sturgeon spawning, are a part of ongoing research by DRBC partners. For both instream and estuary flow needs, the seasonal components affecting both flow and temperature are currently the principal elements of concern. The Trenton flow objective was set to ensure adequate fresh water flows to protect drinking water intakes in the tidal river. Predictions indicate long-term diminution of snow pack and melt as a regional effect of climate change, which may have implications for flow management alternatives to meet the flow objective. The protection of instream flow needs may require adjustments to allocation and discharge permitting criteria, particularly if flow targets are adjusted.

### 1.2.3. Flow Modeling

An understanding of water supply, storage and flow regimes is essential for managing the water resources of the basin. DRBC continues to develop and use modeling tools to aid in the evaluation of water resources management and associated risks in the basin. In particular, the models are used to assess reservoir operations for water supply, flood control, power generation and recreation, the impacts of such operations on basin resources, the ability of reservoirs to meet intended and multiple objective uses, and the effectiveness of conservation releases. DRBC is working with the US ACOE, Philadelphia District, to compare salinity (chloride) predictions from the Commission's 1-D model (DYNHYD5/WASP5) and the Corps' 3-D model (CH3-Dz). If comparable, these models could be used to evaluate flow targets and reservoir operations on salinity levels in the estuary.

See also Supplemental Table B for a summary of all proposed modeling activities.

**Annual Hydrologic Report.** A summary of hydrologic conditions in the basin including precipitation, streamflow, reservoir storage, groundwater levels, and the river mile location of the 7-day average 250 mg/l chloride concentration is prepared annually. Reports are posted on the DRBC web site.

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### 1.2 MULTI-OBJECTIVE FLOW MANAGEMENT

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
FFMP	Analyses and Reports to support Decree Party decision-making	On-going	General Fund
FFMP	Modification of existing model to reflect NYC's OST Support Tool. Revised model will be referenced as DRB-PST (Planning Support Tool)	2014-2015	Grant from NYC and General Fund

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FFMP	Update Water Code to reflect new multi-year FFMP	2015-2016	General Fund
DSS Improvement	Support for FFMP assessments. Model links to evaluate impact of reservoir operations on habitats	2014-2016	USGS (WaterSMART) / NPS / USFWS
Salinity Model	Work with the USACOE, Philadelphia District to compare salinity predictions from the Commission's 1-D model (WASP5) and the Corps' 3-D model (CH3-Dz)	2014-2016	General Fund
Annual Hydrologic Report, Event Summaries	Report – post on web; limited paper copies	2014-2016	General Fund
Instream Flow Management Step 1	TNC Instream Flow Study and resulting recommendations	2013-2014	General Fund/ PA Act 220
Instream Flow Management Step 2	Develop Pass-by flow, conservation release, consumptive use mitigation trigger policy (part of Sustainable Water Future 2060)	2014-2016	General Fund

### 1.3 WATER SUPPLY MANAGEMENT: CONSERVATION, SPECIAL AREA MANAGEMENT, AND PERMITTING

#### 1.3.1 Water Conservation and Loss Accounting

DRBC's water conservation program incorporates a wide range of elements, including, but not limited to requirements for metering, leak detection and repair programs, water conservation plans, water conservation performance standards for plumbing fixtures, and most recently, a water audit requirement to deliver staged improvements in accounting for water loss in distribution system based on the methodology proposed by the American Water Works Association (AWWA). The new rule requires water suppliers to submit calendar year 2012 data in its new format early in 2013. This information will inform water use analyses and improve supply planning. Analysis of the results of this program will inform the development of performance metrics. Additional areas of investigation may include compiling information on innovative water pricing structures which could provide an incentive for water conservation as well as stable revenues for water purveyors, and on water reuse to provide additional tools for improving water use efficiency.

#### 1.3.2 Special Management Area: Southeast PA Groundwater Protected Area (SEPA GWPA)

The Commission will focus analysis efforts on the subbasins of the SEPA GWPA where use assessments indicate subbasins are potentially stressed or near their withdrawal limit. The Commission will continue to monitor conditions and work with docket holders and permittees to find realistic supply solutions and to ensure that allocations support sustainability in the GWPA. The Commission also plans to enhance its tracking of groundwater level conditions and increase its use of annual hydrogeologic reports submitted by docket/permit holders. This information and program status report will be used to provide a more comprehensive analysis of groundwater level conditions across the GWPA.

#### 1.3.3. Dockets and Permitting

DRBC's regulatory activities remain important for water supply management and planning. In order to eliminate unnecessary redundancy and to streamline project reviews, updated administrative agreements between the Commission and the states of New Jersey and Delaware were executed in December 2009 (NJ) and July 2010 (DE). The Commission expects to execute similar agreements with the Commonwealth of Pennsylvania and the State of New York in FY 2014 and 2015 regarding water withdrawals. DRBC will continue to support state partners in their permitting programs through data

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collection, assessment, and planning, and will issue water supply dockets in accordance with Administrative Agreements and special area management programs, including withdrawals for natural gas development. The DRBC database will be updated to incorporate state permit conditions.

### 1.3.4. Compliance

In FY2014, staff will continue annual reviews of DRBC-required data submission, such as the Water Audit Reports. In FY2014, pre-emptive correspondence and notification systems will be initiated for docket expiration dates and data/report submittal date reminders.

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### 1.3 WATER SUPPLY MANAGEMENT

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
Water Conservation & Loss Accounting	Assess data inputs from 1 <sup>st</sup> year of Water Audit submissions	2014-2015	General Fund
	Develop performance metrics for water loss accounting	2015-2016	
Southeastern PA Ground Water Protected Area	Evaluation of water use in subbasins of SEPA GWPA against allocation and supply limits	2014-2016	PA SEPA GWPA
	Preparation of GWPA Status Report	2015	
Water Supply Dockets	Review and processing of water supply dockets in accordance with AAs	2014-2016	Project Review Fees
	Update DRBC database to incorporate NJ & DE allocation permit conditions	2014-2016	General Fund
Compliance	Construction start/completion forms, monitoring requirements, docket expirations	2014-2016	General Fund

### 1.4 DETERMINING WATER QUALITY AND MEETING STANDARDS:

#### CRITERIA-BASED PROGRAMS, ANTI-DEGRADATION, WATER QUALITY ADMINISTRATION

Note: Details on Aquatic Life, including ecosystem needs and restoration, are in Section 2.3.

#### 1.4.1. Special Protection Waters

The Delaware River Basin is unique in having many miles of high quality waterways in the midst of the densely populated Mid-Atlantic metropolitan area. It provides an enormous benefit to the citizens and workers of the Basin and presents a management challenge to maintain existing water quality in a region of substantial population change. The Commission will continue to work with the states in the implementation of the Special Protection Waters (SPW) program to maintain existing water quality in the non-tidal river. See also Section 1.4.4. Water Quality Dockets and Permitting for information on advancing coordinated wastewater permitting.

Commission staff are currently in the process of completing site-specific definition of Existing Water Quality for Interstate and Boundary Control Points of the Upper and Middle Delaware River and its tributaries. The EWQ targets will be statistically-defined numeric antidegradation goals for selected conventional, nutrient, and Marcellus Shale water quality constituents. Site-specific water quality targets will improve the ability of DRBC and NPS to implement Special Protection Waters permit review and assessment of measurable change. Once completed, the targets will contribute to updating Special Protection Waters rules and guidance in FY 2014. Measurable change assessments for the Lower Delaware River will be completed in FY 2014. In FY 2014-16, DRBC and NPS will undertake monitoring for assessment of measurable change in the Upper and Middle Delaware.

#### 1.4.2. Criteria Based Program

DRBC's criteria based program will continue to focus efforts on the assessment of water quality, and support of project review. While traditional physical/chemical approaches will continue, increasing

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emphasis will be placed on establishing methodologies for assessing ecosystem health appropriate for the large river system. Specific species of concern will be addressed through other programs and activities.

### 1.4.2.A. Monitoring Programs to Assess Criteria

#### 1.4.2.A.1. Long Term Boat Run Monitoring

The long term estuary monitoring program conducted by the Commission (Boat Run Survey) currently includes 7 sampling events at 22 stations in the tidal river and bay. This program provides data to assess compliance with Commission water quality criteria, and also provides data on nutrient concentrations and potential effects. With rising costs under static funding, the Boat Run monitoring program has been reduced over time. The number of stations, the number of sampling events, and analytical parameter scope of have all been decreased to stay within fixed budgets.

DRBC has water quality criteria, designed to protect human health and aquatic life, for which no sampling has been performed in over a decade. In FY-2014, DRBC will devise a rotating monitoring plan to ensure that all criteria are periodically assessed. DRBC will identify the funding needs and seek partners to ensure that we are adequately protecting human health and aquatic life by monitoring and assessing against adopted criteria.

#### 1.4.2.A.2. Dissolved Oxygen Criteria Updates

Oxygen is a fundamental requirement for nearly all animal life on our planet. In aquatic environments, organisms ranging from fish to insects to small protozoans utilize the gaseous oxygen that is dissolved in water in order to respire or "breathe," and scientists measure this needed resource as Dissolved Oxygen, also known simply as DO.

Although the worst of the dissolved oxygen problems have been addressed over the past 50 years, dissolved oxygen conditions remain a concern even today. While current conditions typically meet the 1967 dissolved oxygen criteria, mid-summer dissolved oxygen is, at times, only 50% or less of full saturation levels in the areas around the Ben Franklin Bridge. At these depressed oxygen levels, studies have shown that significant mortality can occur for juvenile fishes native to the Delaware Estuary (e.g., Atlantic sturgeon).

In a June 2012 white paper, Delaware Division of Fish and Wildlife biologists stated that DRBC's current dissolved oxygen criteria are "inadequate to prevent mortality and reduced growth of young-of-year Atlantic sturgeon." In addition, the Science and Technical Advisory Committee of the Partnership for the Delaware Estuary has recommended that DRBC revisit DO criteria to better protect Atlantic sturgeon and other sensitive species.

DRBC's Water Quality Advisory Committee has constructed a three phased approach for updating the estuary DO criteria consisting of the following steps:

1. Identify the *existing* uses in the estuary (such as limited propagation) and establish DO criteria that support those existing uses;
2. Define the continuum of possible uses in the estuary, and the DO criteria which would be needed to support each level of use. This phase would utilize water quality models and aquatic ecology experts to establish the linkages between each biological endpoint and the allocations needed to support that endpoint. This phase would also require economists and planners to estimate the feasibility and investment required to achieve the defined endpoint levels;
3. Adopt DO criteria to achieve the target use endpoint.

DRBC expects to make significant progress on phases 1 and 2 of this effort in the next 3 years.

#### 1.4.2.A.3. Nutrient Criteria Development

The Delaware Estuary has both high loadings and high concentrations of nutrients relative to other estuaries in the United States. The effects from these high nutrients are not well-understood, but monitoring in the estuary shows many signs of poor ecological health, including a persistent summer dissolved oxygen sag in the urban corridor of the estuary. The Delaware River Basin Commission serves as the lead agency for developing nutrient and/or nutrient-related criteria for the

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Delaware Estuary. Since 2008, the states of New Jersey, Pennsylvania, and Delaware have been working with the DRBC and with representatives of industry, municipal dischargers, academic researchers, environmental groups, and the Federal government to identify appropriate actions and efforts in this nutrient criteria development process.

In coordination with the Water Quality Advisory Committee and its Nutrient Management Subcommittee, DRBC has initiated point discharge monitoring and review of tributary concentrations to determine nutrient loadings. Over the next several years, staff intends to make significant progress on Estuary Eutrophication Modeling and defining the ecosystem nutrient stressor-response relationship. These activities will ultimately allow development and adoption of nutrient criteria, if needed.

### 1.4.2.A.4. Polychlorinated Biphenyls (PCBs)

A polychlorinated biphenyls (PCB) is any of the 209 configurations of organochloride, molecules with 1 to 10 chlorine atoms attached to two benzene rings. PCBs were widely used as dielectric and coolant fluids, for example in transformers, capacitors, and electric motors. Based on evidence that PCBs are persistent in the environment and can cause numerous health effects in the immune, reproductive, nervous and endocrine systems of animals and humans, their manufacture and distribution has been banned. Managing PCBs in the Basin is a major DRBC program. The Commission coordinates its activities to monitor and manage PCBs with the States of New Jersey, Delaware, Pennsylvania and EPA Regions II and III, especially for incorporating PCB monitoring and Pollutant Minimization Plan (PMP) development in NPDES permits. Currently, approximately 100 dischargers are monitoring and/or developing PMP's. All PCB analyses beginning in 2005 are being undertaken utilizing EPA Method 1668A for all 209 PCB congeners. The benefits of using Method 1668A is a better characterization of effluent, comparability of results between dischargers, reduced analytical uncertainty and better long-term trend analysis. Dischargers continue their submission of monitoring information which is housed in an Access database specifically developed for PCB data. This monitoring information is utilized in evaluating the temporal and spatial trends of PCB loadings and the effectiveness of Pollutant Minimization Plan (PMPs) in reducing PCBs. A summarization of loading has been performed and results have been presented to the Commissioners and at a PMP Workshop. The presentation is posted on the Commission's web site at [www.nj.gov/drbc/programs/quality/pmp.html#3](http://www.nj.gov/drbc/programs/quality/pmp.html#3).

The Commission will continue the implementation of the Stage 1 and development of Stage 2 PCB TMDLs, including:

- ongoing point source data review and assessment
- evaluation of Pollutant Minimization Plans (PMPs)
- reporting of progress on Stage 1 TMDL Implementation
- preparation of Stage 2 TMDL and staging of implementation for Zones 2-6

A progress report describing current levels of PCB congeners in ambient water, fish tissue, sediments, estuary airshed and tributaries will be prepared in 2013 for comparison to levels documented in 2003 when the PCB TMDLs for Zones 2 - 5 were established by U.S. EPA. This report will provide the basis for evaluating the temporal and spatial trends of PCB concentrations in various media and the effectiveness of the use of non-numeric NPDES permit requirements including Pollutant Minimization Plan (PMPs) in reducing PCB loadings.

The Stage 2 PCB TMDLs for Zones 2 – 6 of the Delaware Estuary will be developed upon completion of an implementation strategy. The Delaware Estuary PCB model has been enhanced since the development of the Stage 1 TMDLs, which used a model based on one PCB homolog (penta). The revised model was applied to four PCB homologs (tetra, penta, hexa, and hepta) which typically represent over 90 percent of total PCBs in fish tissue. The revised models will be used to develop the Stage 2 PCB TMDLs. In addition, an equitable allocation scheme—Equal Effluent Concentration (EEC)—will be used to develop individual Wasteload Allocations (WLAs) for point sources. The completion of this task is dependent on the completion of the implementation strategy and adoption of a uniform PCB criterion for the Delaware Estuary.

#### 1.4.2.A.6. Metals

DRBC will be studying areas of elevated concentrations of metals and evidence of criteria exceedances as reported in Water Quality Conditions (p11). In addition, the Commission will be focusing attention on the following:

- **Copper.** Copper (Cu) is a naturally occurring trace element found in surface waters and, while essential to virtually all plants and animals, it can be toxic to aquatic life even in low concentrations. Concern about exceedances in Zones 5 and 6 are driving the DRBC initiative to collect additional data to further evaluate and to potentially use the Biotic Ligand Model (BLM) recommended by EPA. BLM is a tool used in aquatic toxicology to examine the bioavailability of metals in the aquatic environment and the affinity of these metals to accumulate on gill surfaces of organisms. BLM is data-intensive, requiring site-specific water quality parameters such as pH, hardness, and dissolved organic carbon. Collection of water chemistry parameters for a given site, incorporation of the data into the BLM computer model, and evaluation of the output data is used to accomplish the analysis. DRBC is working with the states and EPA through the TAC and MAC.
- **Methylmercury.** Methylmercury (Me-Hg) is known to cause developmental impairments in children in utero and suspected of causing disruptions in the reproductive cycle of some aquatic life. Predominantly sourced from the burning of inorganic wastes and fossil fuels, it has an affinity for chloride, nitrate, and certain proteins and therefore is readily biomagnified in the aquatic food chain. To investigate exceedances of methylmercury in fish tissue residue in Zones 5 and 6, DRBC will be expanding the collection and analysis of fish tissue samples. Heretofore, cost and other constraints have permitted only analysis of total mercury (T-Hg) in tissue samples. New techniques are making it possible to now measure Me-Hg concentrations and compare them to current T-Hg criteria. DRBC is coordinating with the States and EPA through the TAC and MAC.

#### 1.4.2.A.7. Chronic Toxicity

Chronic toxicity is caused by repeated or long-term exposure to low doses of a toxic substance. In 2000, the Commission determined that the assimilative capacity of Zones 2-5 for chronic toxicity had been exceeded. Based on the chronic toxicity studies of ambient river water from the tidal Delaware River undertaken by the DRBC in 2000 and 2001, Zone 5 is currently listed as a Category 3 water for chronic toxicity (insufficient or no data and information to determine if any designated use is attained). FY 2014 work will focus data collection on portions of the Delaware River Estuary in DRBC Water Quality Zones 4 and 5 to provide additional data to help address ambient water toxicity issues. The specific objectives of this study are to assess if toxicity is present in river water samples as measured by laboratory controlled methods for short-term chronic toxicity. These data will supplement and confirm previous toxicity assessments in the Delaware River. Additional work will include preparation of a narrative report describing the trends in effluent chronic toxicity data from the early 1990s to the present. The purpose of this assessment is to assess cumulative loading trends in discharges from industrial and municipal facilities, and the potential for exceedances of the 1.0 Toxic Unit chronic water quality standard of the Commission.

#### 1.4.2.B. Contaminants of Emerging Concern

From a multi-year survey (2007, 2008 and 2009) of emerging contaminants of concern in ambient water of the tidal Delaware River, the DRBC identified a prioritized list of pharmaceuticals and personal care products (PPCPs) as well as perfluoroalkyl and polyfluoroalkyl substances (PFASs), and polybrominated diphenyl ethers (PBDEs) for further evaluation of sources, fate and effects in water column, sediments and biota ([www.nj.gov/drbc/library/documents/contaminants-of-emerging-concernJuly2012.pdf](http://www.nj.gov/drbc/library/documents/contaminants-of-emerging-concernJuly2012.pdf)). In FY2014-2015, DRBC staff will participate with Temple University in a special study of personal care products and pharmaceutical compounds in ambient waters of Southeastern Pennsylvania as part of Pennsylvania Sea Grant project.

#### 1.4.2.B.1. Dioxins & Furans

Dioxins/furans, by-products of industrial processes, are commonly regarded as toxic and persistent organic pollutants (POPs). Dioxins/furans are contaminants of concern contributing to fish advisories in the Delaware Estuary. There are 75 different dioxins and 135 different furans. DRBC

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has adopted water quality criteria for the most toxic compound: 2,3,7,8-TCDD. Dioxin/furan concentrations in fish tissue are currently being addressed through fish consumption advisories and other environmental management approaches in the Delaware Estuary. DRBC is coordinating with states and other agencies through the Toxic Advisory Committee (TAC) to assess and manage dioxins and furans as needed to reduce human health impacts through fish consumption. A toxic equivalency approach in water quality standards addresses a suite of dioxin and furans by relating the toxicity of these compounds, including the toxicity of twelve dioxin-like PCB congeners with similar structure to 2, 3, 7, 8 - TCDD. The TAC has tasked its Criteria Subcommittee to summarize and evaluate the available water, sediment and biota data to determine whether a similar approach should be adopted for the Delaware Estuary through revisions to the Commission's Water Quality Regulations. The TAC is expected to complete their deliberations in the next two years.

### **1.4.2.C. Recommended Actions to Improve Water Quality Assessment Efforts**

Based on the water quality conditions and assessment issues presented in Section I.C., DRBC is planning revisions to the water quality management program as follows:

- adoption of new pH criteria
- adoption of surface water temperature criteria in Zones 1A through 1E
- continue work on better defining the linkage between atmospheric and meteorological drivers, in order to estimate the proportion of temperature exceedances attributable to potentially controllable anthropogenic activities
- continue work with other sponsors to ensure that continuous monitoring resources are established in Zones 1A through 1D
- perform additional data collection using enhanced analytical methods, modified collection procedures and changes in the spatial scale of sampling in segments of the Delaware River which have exhibited apparent copper exceedances and for which little or no recent data is available. The information collected will provide additional data to more accurately determine metal concentrations in ambient water and the impact of metals on water quality. Coordination among basin states and agencies should continue to ensure the use of the most appropriate methods and procedures for the conduct of monitoring studies in the Basin, and the harmonization of water quality criteria and assessment methodologies.

See also Summary Table C: Schedule of DRBC Water Quality Revisions - 3 year Plan for Criteria, for additional detail.

### **1.4.3. Water Quality Modeling**

In the non-tidal river, model development will also continue with the ongoing calibration and validation of QUAL2K models for the Lower Delaware, Lehigh River, and Brodhead Creek throughout FY 2014 to 2016. A water quality model for the Neversink River was developed in FY09 and 10 and will be updated throughout FY14 with instream water quality monitoring from the Neversink River watershed. See also Special Protection Waters program Section 1.4.1. Also, the Pinchot Institute has contracted with DRBC to develop a monitoring program on the Neversink.

In the estuary, a 1-D eutrophication model will be developed and linked with the existing 1-D hydrodynamic model to be used as a screening level model prior to the development of a sophisticated 3-D model. Based on findings from the 1-D modeling effort, the 3-D hydrodynamic model and eutrophication models will be developed to support the Commission's nutrient strategy. In cooperation with US ACOE, the Corps' 3-D hydrodynamic model is being evaluated for salinity levels linked to reservoir operations, apart from the nutrient issues. See Section 1.2.3. Flow Modeling for a fuller explanation and Supplemental Table B for a summary of ongoing and proposed modeling activities through FY 2015.

### **1.4.4. Water Quality Dockets and Permitting**

DRBC's regulatory activities remain important for water quality management. In order to eliminate unnecessary redundancy and to streamline project reviews, updated administrative agreements between the Commission and the states of New Jersey and Delaware were executed in December 2009 (NJ) and



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July 2010 (DE). The Commission expects to execute similar agreements with the Commonwealth of Pennsylvania and the State of New York in FY 2014 and 2015. The Commission also expects to develop agreements with the signatory states on a program that will result in "one discharge permit" based on the National Pollutant Discharge Elimination System (NPDES) permit. DRBC will continue to support state partners in their permitting programs through data collection, assessment, mixing zone analyses, no measurable change evaluations, and other modeling, and will issue water quality dockets in accordance with Administrative Agreements, with continued emphasis on cooperative efforts to implement DRBC standards in shared waters.

The Regulated Discharge Ad hoc Committee has been assembled to review state and DRBC review processes and criteria and make recommendations to reduce redundancy by creating a single coordinated permitting approach. DRBC is expected to provide technical support for state regulatory review processes, as needed.

### 1.4.5. Integrated List

DRBC biennially reports on the conditions of main stem river water quality relative to criteria in accordance with EPA guidelines for 305 (b) reporting. The next report is due in April 2014.

### 1.4.6. Compliance

In FY14, staff will continue annual reviews of DRBC-required data submission, such as the annual discharge monitoring reports. In FY2014 and FY2015, pre-emptive correspondence and notification systems will be initiated for docket expiration dates and data/report submittal date reminders.

## DRBC WATER RESOURCES PROGRAM

### 1.4 DETERMINING WATER QUALITY AND MEETING STANDARDS: CRITERIA-BASED PROGRAMS, ANTI-DEGRADATION, WATER QUALITY ADMINISTRATION

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
Water Quality Standards	Update water quality policy and standards	2014-2016	General Fund
	Revise water quality criteria	2014-2016	General Fund
Scenic Rivers Monitoring Program	Data and report	2014-2016	EPA §106, NPS
	Report on changes to EWQ in Lower Delaware	2014	EPA §106
Lower Delaware River & Tributaries Model	Model refinement, calibration, and validation	2014-2016	EPA §106, NPS and General Fund
Brodhead Creek Model	Model refinement, calibration, and validation	2014	General Fund
Neversink River Model	Model refinement, calibration, and validation	2014-2015	General Fund, EPA §106, Pinchot Institute
Neversink watershed WQ monitoring project	Assessment of water quality monitoring data related to land-use types	2014	Pinchot Institute
Lehigh River Model	Model refinement and validation	2014-2016	General Fund
Boat Run Survey	Develop rotating monitoring plan to ensure periodic assessment of all parameters (criteria)	2014-2015	EPA §106
	Data in WQX	2014-2016	EPA §106
	5 year report on conditions including living resources	2015	EPA §106

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<b>Program/Project</b>	<b>Products/Outputs</b>	<b>Fiscal Year</b>	<b>Funding Sources</b>
Estuary Nutrients	Ambient monitoring for nutrient parameters	2014-2016	EPA §106
	Collection of point source monitoring	2014	EPA §106
	Analyze point source monitoring data	2015	EPA §106
Metals (Cu, Hg)	Monitoring and analysis in zones showing elevated concentrations and/or criteria exceedances	2014-2016	Potential EPA §106
Chronic Toxicity	Ambient surveys and trend analysis of effluent data	2014-2016	EPA §106
PCBs	Evaluate PMPs	2014-2016	EPA §106
	Report on Stage 1 Implementation		
	Develop and Implement Stage 2		
Toxics (Dioxins and Furans)	Data summaries and criteria recommendations from TAC	2014-15	General Fund
Water Quality Dockets	Development of single coordinated permitting per directive of Regulatory Discharge Ad hoc Committee	2014	General Fund
	Changes to Water Quality regulation & Rules of Practice & Procedure as required	2014-2015	General Fund
	Review and processing of water quality dockets per AAs	2014-2016	Project Review Fees
Integrated List Water Quality Assessment Report	Prepare assessment for EPA and states	2014	EPA 106 Grant/General Fund
Compliance	Construction start/completion forms, monitoring requirements, annual effluent monitoring reports, docket expirations	2014 - 2016	General Fund
Emerging contaminants of concern (COCs)	Special study of Personal Care Products/Pharmaceuticals in SEPA.	2014	PA Sea Grant Match
Eutrophication Model for Delaware Estuary	Development of screening level 1-D eutrophication model	2014	EPA §106 Pending
	Selection and development of a state of the art 3-D hydrodynamic and eutrophication model. Data collection for model calibration.	2014-2015	
	Model calibration and validation for CBOD reallocation, potentially NBOD and/or ammonia allocations and other nutrient parameters.	2015-2016	

**Section 2.0 WATERWAY CORRIDOR MANAGEMENT**

- 2.1 Flood Warning and Loss Reduction
- 2.2 Enhanced Recreation
- 2.3 Aquatic Life and Wildlife Habitat Improvement

**2.1 FLOOD WARNING AND LOSS REDUCTION**

Flood loss reduction is a shared responsibility among federal, state, and local agencies and organizations in the Delaware River Basin. DRBC's activities involve coordination, planning and operational functions. DRBC's Flood Advisory Committee (FAC; see Section 4.4 for more on Advisory Committees) brings together government and non-governmental stakeholders across jurisdictional boundaries and facilitates coordination among agencies to improve the basin's flood warning system and mitigate flood losses.

Climate models indicate a trend towards more extreme precipitation cycles in the Northeast. Floods and droughts are likely to become more common and intense as regional and seasonal precipitation patterns change, and rainfall becomes more concentrated into heavy events with longer, hotter dry periods in between. Coupled with an expected rise in sea level, coastal and riverine communities are at a greater risk for flood loss. DRBC will assist with and as appropriate, lead efforts to improve planning, management and regulatory programs to reduce flood losses.

**2.1.1. Flood Mitigation Task Force Recommendations.** As the result of pervasive flooding in 2004-2006, DRBC commissioners convened a Delaware River Basin Interstate Flood Mitigation Task Force. This Task Force produced an Action Agenda consisting of 45 consensus-based recommendations in six priority management areas—flood warning, floodplain mapping, floodplain regulation, stormwater management, structural and non-structural mitigation, and reservoir operations—all focused on a more proactive and systematic approach to flood mitigation within the Delaware River Basin. Many of the priority recommendations have been completed in collaboration with NOAA/NWS, USGS, the Nurture Nature Foundation, and the DRBC Flood Advisory Committee. DRBC will continue to identify opportunities for collaborative implementation of the Task Force recommendations and track progress through FY 2016. The following initiatives are expected over the next three years.

**2.1.2. Flood Warning and Preparedness**

New Jersey has identified three areas within the state where assistance is needed to improve community awareness and response to flooding. In partnership DRBC, in coordination with the Nature Nurture Center (NNC), will assist NJDEP with a project on the Delaware Bayshore. The Coastal Analysis and Mapping Project (FEMA Region II) is creating new Flood Insurance Rating Maps (FIRMs) and a communication strategy for local communities. DRBC and NNC will collaborate on further customization of the preparedness and response messages for New Jersey communities along the Delaware Bayshore.

**2.1.3. Flood Water Management**

A consortium of the USGS, Army Corps of Engineers and NOAA support the Integrated Water Resources Science and Services (IWRSS) program, a new federal initiative to provide a scientific foundation for water resource management. Over the next three years, DRBC will be actively engaged with the federal entities to monitor the development of robust scientific information to support sustainable long term water supply planning for the Basin. Up-to-date and regionally relevant information on changes in expected precipitation patterns, climate, and land use patterns, for example, could have a significant impact on how to prepare for storm events, and manage floodplains. Coordinating through the IWRSS program creates a consistent approach throughout the Basin.

Beyond planning and preparedness, reservoir operating plans and structural changes present flood water management options. DRBC will evaluate potential reservoir management options that may provide additional protection from flood damage, specifically via the development of flood water management plans outlining flood management activities for the larger reservoirs in the basin.

## DRBC Water Resources Program FY 2014-2016

### DRBC WATER RESOURCES PROGRAM 2.1 FLOOD WARNING AND LOSS REDUCTION

Program/Projects	Products/Outputs	Fiscal Year	Funding Sources
Interstate Flood Mitigation Task Force Recommendations	Identification of opportunities for implementation and tracking implementation of recommendations	2014-2016	General Fund, Agency In-Kind
Flood Preparedness	Material and message to improve NJ Delaware Bayshore community flood preparedness	2014-2015	NJDEP (Pending)
Flood Water Management	Collaborative development of scientific foundation for improved flood planning & management (IWRSS)	2014-2015	General Fund
	Recommendations re Basin-wide reservoir flood water management plan and stormwater detention options	2014-2016	General Fund
Flood plain dockets	Review and processing of flood plain dockets	2014-2016	Project Review Fees

## 2.2 ENHANCED RECREATION - No major initiatives to report

## 2.3 AQUATIC LIFE AND WILDLIFE HABITAT IMPROVEMENT

### 2.3.1. Ecosystem Needs

DRBC intends to remain involved in the development and expansion of creative funding opportunities, such as the Delaware River Basin Conservation Act, currently under Congressional consideration for authorization and \$ 5M funding. DRBC will continue to increase the understanding of ecosystem needs and habitat conditions in the basin through ambient water quality monitoring, fluvial geomorphologic assessments, and macroinvertebrate and periphyton surveys conducted in partnership with federal and state agencies. In 2010, Commission staff sampled the non-tidal Delaware River in order to create an Index of Biological Integrity (IBI). The analysis of the sampling data from 2010 is expected to be completed during calendar year 2013 after receipt of the macroinvertebrate taxonomy data. The Biological Advisory Subcommittee to the WQAC will be convened in late 2013 or early 2014 to consider the results of the IBI study.

### 2.3.2. Ecosystem Restoration

**PPL Martins Creek NRDA.** The Commission has agreed to function as the recipient and distributor of certain funds required to be expended as a result of the damages resulting from the 2005 Ash Slurry Spill from the PPL Martins Creek facility, located in Lower Mount Bethel Township, Northampton County, Pennsylvania. The Natural Resource Damage Assessment (NRDA) was developed for the spill by PADEP in consultation with the NJDEP, PA Fish and Boat Commission and the DRBC and is expected to be finalized in calendar year 2013. Upon execution of settlement, the Commission will manage the funds for restoration projects located entirely within Pennsylvania and those defined as "mussel restoration projects," which may be located in Pennsylvania and/or New Jersey. The Pennsylvania restoration projects consist of four dam removals on the Bushkill Creek and the Little Lehigh River. The Commission will enter into grant agreements with local watershed organizations, which are expected to assume lead roles in removal of the identified dams located within Pennsylvania. The watershed organizations are expected to be responsible for all design, permitting, administrative and construction costs. DRBC staff will supervise performance under the grant agreements to ensure that the deliverables are carried out in a timely manner that is consistent with the Settlement terms.

## DRBC Water Resources Program FY 2014-2016

### 2.3.3. Invasive Species Management

In response to the rapid proliferation of *Didymosphenia geminata* (also known as *Didymo* or "Rock Snot") throughout the non-tidal Delaware basin, DRBC is coordinating with scientists from Pennsylvania, New York, New Jersey, and the National Park Service to alert the public and monitor its spread. Didymo is a concern because it stifles ecosystem productivity. Surveys to monitor the bloom's locations and densities began in the late spring and summer of 2012. The Commission received an \$18,000 Pennsylvania Sea Grant to study the relationship between nutrient levels and Didymo concentrations.

### 2.3.4. Regional Sediment Management

The US ACOE has led a group of agencies in the development of a Regional Sediment Management (RSM) Plan as recommended in the *Water Resources Plan for the Delaware River Basin 2004* (Basin Plan, Objective 2.3.F.) Two Teams have been created: the RSM Implementation Team will work with agencies and other entities to oversee the beneficial re-use of dredge spoils; the Regional Dredging Team will work to prevent or address water quality issues at spoil sites. DRBC staff will continue participation in both teams.

## DRBC WATER RESOURCES PROGRAM

### 2.3 AQUATIC LIFE AND WILDLIFE HABITAT IMPROVEMENT

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
Ecosystem Needs	Review data and create an Index of Biological Integrity	2014-2015	EPA §106
Ecosystem Restoration	Manage distribution of funds for PPL Martins Creek NRDA projects	2014-2016	PPL NRDA settlement via PADEP
Invasive Species Management	Report on evaluation of nutrient impacts on Didymo	2014-2015	PA Sea Grant, EPA §106
Regional Sediment Management	Participation in RSM Implementation and Regional Dredging Teams	2014-2016	General Fund

## DRBC Water Resources Program FY 2014-2016

### Section 3.0 LINKING LAND AND WATER RESOURCE MANAGEMENT

- 3.1 Integrated Resource Management and Watershed Partnerships
- 3.2 High Value Water Resource Landscapes

#### 3.1 INTEGRATED RESOURCE MANAGEMENT AND WATERSHED PARTNERSHIPS

##### 3.1.1 Watershed Management Partnerships

DRBC watershed management efforts include watersheds that involve two or more states as well as projects within a single basin state, typically as pilot programs for larger multi-jurisdictional management efforts. Staff is involved with collaborative partnerships in these watersheds:

- **Christina Watershed.** DRBC is a founding member of the Christina Basin Clean Water Partnership, which was established in the 1990s to improve water quality in the 300-sq. mi. interstate watershed. DRBC participates in activities and provides support as the Partnership continues implementation of its long term clean water strategy.
- **Schuylkill River Watershed.** DRBC is a founding member of the Schuylkill Action Network (SAN), a collaboration among federal, state, regional agencies for local implementation of source water protection projects. DRBC continues to serve on the Executive Steering & Planning Committees to oversee Work Groups that prepare and execute projects to improve the management of stormwater, agricultural activities, wastewater discharges, and mining reclamation. In addition, a portion of the Schuylkill River Restoration Fund is directed to projects identified through SAN as priority source water protection projects.
- **Common Waters.** DRBC is a member of the Common Waters collaborative, which is led by the Pinchot Institute and dedicated to protection of the headwaters of the Delaware River Basin.

##### 3.1.2 Watershed Restoration

The Schuylkill River Restoration Fund, a unique public/private partnership, provides grants to government agencies and non-profit organizations for projects that improve the quality of water in the watershed. The grants focus on three major sources of pollution: stormwater run-off, agricultural pollution and abandoned mine drainage. DRBC participates in the steering committee that reviews proposals, selects projects for funding, and oversees program direction and expansion.

#### 3.2 HIGH VALUE WATER RESOURCE LANDSCAPES

DRBC promotes sound practices of watershed management in the Basin (Compact §7.1). The Basin Plan goals regarding watershed management include:

- Preserving and restoring natural hydrologic cycles through improved stormwater management
- Maintaining and restoring the function of High Value Water Resource Landscapes
- The integration of water resource considerations into land use planning and growth management

The protection of water resources is indicative of all DRBC programs, regulations and permit conditions. The Decision Support Tool (DST) being developed for the evaluation of Natural Gas Development Plans includes GIS mapping of High Value Water Resource Landscapes and a template for assessing these landscapes in light of proposed large-scale development. The DST is expected to be usable by local agencies as a screening tool for managing development while protecting landscapes critical to the flow and quality of basin waters. See more under the Special Section on Natural Gas Regulations, p. 16.

DRBC participates in setting water research priorities and evaluating proposals submitted to the NJ Water Resources Research Institute (NJWRI) for project funding through USGS. DRBC is also part of the Schuylkill River Restoration Fund (SRRF) steering committee that reviews proposals for restoration and land conservation projects in the Schuylkill watershed. Currently, Exelon, the Philadelphia Water Department, the Partnership for the Delaware Estuary and Aqua Pennsylvania contribute to the SRRF.

**DRBC Water Resources Program FY 2014-2016****DRBC WATER RESOURCES PROGRAM  
3.0 LINKING LAND AND WATER RESOURCE MANAGEMENT**

<b>Program/Project</b>	<b>Products/Outputs</b>	<b>Fiscal Year</b>	<b>Funding Sources</b>
Christina Clean Water Partnership	Continued participation to meet Long Term goal of restoring the water quality of all watershed streams to designated uses by 2015	2014-2016	General Fund
Schuylkill Action Network	Collaborative facilitation and oversight of watershed improvement projects for source water protection	2014-2016	General Fund
Common Waters	Collaborative led by the Pinchot Institute dedicated to protection of the headwaters of the Delaware River Basin	2014-2016	General Fund
Watershed Restoration: Schuylkill River Restoration Fund	Annual review and recommendations of projects for funding	2014-2016	General Fund
High Value Water Resource Landscapes	Mapping and availability of information on HVWRLs to support decision making and water resource protection	2014	William Penn Foundation

## DRBC Water Resources Program FY 2014-2016

### Section 4.0 INSTITUTIONAL COORDINATION & COOPERATION

- 4.1 Intergovernmental Coordination
- 4.2 Data Sharing & Management
- 4.3 Agency Funding
- 4.4 Associations and Internal Advisory Committees
- 4.5 Utilizing Planning and Regulatory Authority

#### 4.1 INTERGOVERNMENTAL COORDINATION

**4.1.1. Federal and Interagency Collaborative Partnerships.** It is important that the activities and authorities of the Commission and of the multiple Federal, state and local governmental agency efforts to manage the water resources of the basin are conducted in a coordinated and supportive fashion. Collaboration among state and interstate agencies across basin boundaries encourages the exchange of information, ideas, and experience, and supports initiatives of benefit to member agencies and to water resources management generally. The Commission is involved in several federal/state initiatives that not only stimulate positive environmental outcomes in the basin, but also help shape water policy on regional and national scales. Other activities are focused on improving coordination and collaboration generally among federal and state agencies with authorities within the Basin, as well as with regional entities. For FY2014-2016, this includes many ongoing as well as special initiatives, some described in more detail under other sections, as noted.

- **Federal Summit.** The Army Corps is the lead agency for a biennial summit of federal agencies. DRBC will assist the Army Corps as needed for the planning of the Federal Summit.
- **WaterSMART.** DRBC is partnering with USGS on a three year multi-million dollar long-range water supply sufficiency evaluation project. See details in Section 1.1.1.
- **Integrated Water Resources Science and Services (IWRSS) initiative.** Working with US Army Corps, USGS and NOAA to provide scientific foundations for water resources management. See also 2.1.3 Flood Water Management.
- **Delaware Estuary Program.** Participation in multiple committees (Steering, Estuary Implementation, Science and Technical Advisory), as well as special projects (State of the Estuary) and events (biennial Science Conference).
- **Upper Delaware Council.** DRBC is a non-voting member the Council which encourages collaboration among municipalities in the Upper Delaware Scenic River corridor and reviews actions for conformity with area-wide Management Plan.
- **Fish & Wildlife Management Cooperative (Delaware River Basin).**

**4.1.2. State-DRBC Coordination.** Actions and activities to improve coordination with agencies of the basin states include:

- **Update DRBC-State Administrative Agreements.** Working with state staff to review statutory and regulatory authorities as well a current procedures and practices of the Commission and state agencies pertinent to projects subject to Commission review under Section 3.8 of the Compact, to eliminate unnecessary and unproductive redundancy in project review procedures and requirements. Revised Administrative Agreements have been signed with New Jersey and Delaware, and negotiations begun with Pennsylvania and Delaware with particular focus on State and DRBC wastewater regulatory roles. Commission staff will continue to coordinate with DRBC advisory committees (see Advisory Committees, below) as appropriate. See also 4.4. Internal Advisory Committees for discussion of related goals of the new Regulated Discharge Ad hoc Committee.
- **State Advisory Committees.** DRBC participates in the Delaware Water Supply Coordinating Council, the New Jersey Water Supply Advisory Council, NJDEP Water Monitoring Coordinating Council, and serves as a legislated member of the New Jersey Clean Water Council.



## DRBC Water Resources Program FY 2014-2016

- **New Jersey Water Resources Research Institute (NJWRRI).** DRBC is a member of the steering committee for the Institute in New Jersey at Rutgers University. Each state has a WRRI through which USGS provides funds to support research in water resource issues.

### 4.2. Data Sharing and Management

Maintaining a Geographic Information System (GIS), along with gathering, processing, and mapping new data, is crucial for water resource management programs and projects within and external to DRBC. Maintaining the Commission's Integrated Database, which includes water charging, water use, communications, and project review information is also vital to implementing core Commission programs. The Commission's library and central files contain hard copies of the Commission's dockets and applicant information, vital to day to day operations and serves as the mechanism to capture and log official Commission actions.

### 4.3. Agency Funding

This goal of the Basin Plan acknowledges the necessity of securing adequate resources to support water resource management, as well as the challenge of doing so. DRBC management works to secure funding for ongoing agency support as well as for special projects.

### 4.4. Associations and Internal Advisory Committees

This category includes both voluntary partnerships with national and international organizations and committees assembled by DRBC for expert advice and support for the development and implementation of DRBC programs.

**4.4.1. Associations.** DRBC remains a partner in the Association of Clean Water Administrators (ACWA), the Interstate Council of Water Policy (ICWP), the American Water Resources Association (AWRA), the new Clean Water America Alliance (CWAA), and the Common Waters/Pinchot Institute upper basin protection initiative. As water resource management faces the growing challenges associated with a changing climate, a challenging fiscal future and infrastructure needs and shifting political environments, involvement with these partners will be of increasing benefit to DRBC.

**4.4.2. DRBC Internal Advisory Committees.** Continuing a long standing practice, advisory committees aid the Commission in policy and standards development. Committees for flow, flood, toxics, monitoring, water quality and water management meet as needed. All administrative needs are met by DRBC staff, including the development of agendas, arrangement of venues, communicating with members, and processing formal meeting minutes. Staff also coordinates internally on issues that cut across the interests or expertise of more than one committee. Major focus issues for the Advisory Committees and subcommittees include:

- **Water Quality Advisory Committee.** The WQAC will be focusing on a review of nutrient issues in the estuary, and the review of designated use and associated criteria for Zones 3-5, and the implementation of recommended revisions to temperature and pH criteria. Two subcommittees – Nutrient Management Subcommittee and Biological Advisory Subcommittee - have been formed to assist with the evaluation of nutrient and biological criteria development. Also, work is underway to: a.) develop a eutrophication model to test alternative water quality management scenarios and b.) facilitate outreach regarding management options. Work of an expert panel to consult on dissolved oxygen needs of estuarine aquatic communities will continue in FY 2014-15.
- **Regulated Flows Advisory Committee.** The RFAC serves as a vehicle for public input into the Flexible Flow Management Program and will continue to focus on reservoir operations, instream flow needs and other issues to support the Decree Parties in their work on the Flexible Flow Management Plan. The Subcommittee on Ecological Flows (SEF) will continue its work on flow needs for cold water communities and extend research into warm water fisheries.
- **Flood Advisory Committee.** The FAC will be focusing on outreach for flood warning & mitigation, coastal flood mapping, integration of federal & state programs for increased efficiency & efficacy.
- **Monitoring Advisory Committee.** The MAC will be focusing on the coordination of monitoring and maintenance of monitoring systems in the basin for flows and water quality.

## DRBC Water Resources Program FY 2014-2016

- **Toxics Advisory Committee.** The TAC will be focusing on the implementation of PCB criteria and Stage 2 TMDL, as well as the review of new and existing toxics criteria as appropriate,
- **Water Management Advisory Committee.** The WMAC will be focusing on the results of the water loss accounting program, evaluation of consumptive use policy, instream flows and supply sufficiency.
- **Regulated Discharge Ad hoc Committee.** This ad hoc committee is reviewing state and DRBC discharge permit review procedures and criteria to reduce redundancy and create a single coordinated permitting process for dischargers.
- **Water Charging Advisory Committee.** This ad hoc committee has been established to advise the Executive Director on matters relating to potential changes to the Commission's water supply charging program and rates, including review of evaluations performed by contract consultants.

See also Supplemental Table A for an overview of prospective program rule changes that may involve Advisory Committee input, and Supplemental Table C for a schedule of prospective changes to water quality standards and actions relevant to the toxics and water quality committees.

### 4.5 UTILIZING PLANNING AND REGULATORY AUTHORITY

This Basin Plan goal is to use the planning and regulatory authority of the Commission to facilitate, coordinate and effect cooperation among water resource efforts across the Basin. Staff efforts to improve and direct the efficiency of DRBC programs include preparation of tools to guide resource allocation in accordance with Commissioner priorities. Based upon the mandate of the Compact and the goals of the Basin Plan, the Water Resources Program (WRP) notes the current conditions and needs of the basin, the scope of DRBC programs, and the expected milestones to be achieved for a three fiscal year time horizon. The Annual Work Plan (AWP) for each year, extracted from the WRP, provides the planned activities and allotment of resources necessary for the upcoming fiscal year. The DRBC Budget details the receipt and distribution of financial resources in order to carry out the associated AWP.

- **Water Resources Program.** A prospective, multi-year program prepared annually.
- **Annual Work Plan.** Prepared annually.
- **DRBC Budget.** Prepared annually.

## DRBC WATER RESOURCES PROGRAM

### 4.0 INSTITUTIONAL COORDINATION AND COOPERATION

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
Federal & Interagency Collaborative Partnerships			
US ACOE 4 <sup>th</sup> Federal Summit	Consensus on water resource priorities and collaborative agenda	2014, 2016	General Fund
USGS WaterSMART	Improved data & demand analysis; long-range water supply sufficiency analysis	2014-2016	General Fund
IWRSS	Participation with NOAA, USGS, ACOE for hydrologic science foundation for management & operational decision making	2014 - 2015	General Fund
Delaware Estuary Program	Participate in multiple committees (Steering, EIC, STAC)	Ongoing	General Fund
Upper Delaware Council	Ex-Officio Member; 6 meetings per year	Ongoing	General Fund

**DRBC Water Resources Program FY 2014-2016**

Fish & Wildlife Management Cooperative	Coordination, management plans	Ongoing	General Fund
Pinchot Institute for Conservation	Board Member; 6 meetings per year	Ongoing	General Fund
<b>State – DRBC Coordination</b>			
Revise/Update DRBC-State Administrative Agreements	4 New DRBC-State Administrative Agreements	2014-2015	General Fund
Delaware Water Supply Coordinating Council	Meetings as scheduled	Ongoing	General Fund
NJ Clean Water Council, permanent legislated member	Monthly meetings, periodic chairmanship, annual public hearing	Ongoing	General Fund
NJ Water Supply Advisory Council	Meetings as scheduled	Ongoing	General Fund
NJ Water Monitoring Coordinating Council	Meetings as scheduled	Ongoing	General Fund
NJ Water Resources Research Institute	Set research priorities; annual evaluation of research proposals for funding	2014-2016	General Fund
Data Sharing and Management	IT systems update and maintenance, GIS data assembly, processing and distribution; time management structure and accounting	Ongoing	General Fund
Securing Funding	Meetings with federal and state legislators, state agency managers and others re DRBC mission and value	Ongoing	General Fund
<b>Associations</b>			
ACWA	Contribute to discourse on national water policy, federal legislation and support for gaging infrastructure and the development of federal decision support tools for water resource decisions	FY 2014-2016	General Fund
AWRA			
CWAA			
ICWP			
Common Waters/Pinchot Institute	Participate in upper basin protection initiatives	FY2014-2016	General Fund
<b>DRBC Advisory Committees</b>			
DRBC Advisory Committees	Meetings as scheduled and/or necessary	Ongoing	General Fund

**DRBC Water Resources Program FY 2014-2016**

DRBC Strategic Documents			
Water Resources Program	Prepared annually	FY 2014-2016	General Fund
Annual Work Plan	Prepared annually	FY 2014-2016	General Fund
DRBC Budget	Prepared annually	FY 2014-2016	General Fund

## DRBC Water Resources Program FY 2014-2016

### Section 5.0 EDUCATION AND OUTREACH FOR STEWARDSHIP

- 5.1 Reporting
- 5.2 Public Information
- 5.3 Technical Outreach
- 5.4 Promoting Stewardship

#### 5.1 REPORTING

Many DRBC projects and programs have individual reporting elements. These are included as products and outputs for the fiscal year of their scheduled delivery. There are also routine reporting activities that require more significant resources for coordination, integration, and production. Among these are:

- **State of the Basin Report.** By resolution, DRBC is to compile an indicators report every five years to review current trends and conditions in the Delaware River Basin. The second conditions report is an abbreviated tri-fold report that was prepared in FY 2013 and utilized the Technical Report for the Estuary and Basin completed in 2012.
- **DRBC Annual Report.** Required by the Compact, this report reviews programs, activities, products, and milestones achieved during a calendar year.

#### 5.2 PUBLIC INFORMATION

DRBC staff responds in a timely manner to inquiries and requests from the general public, federal/state/local government officials, regulated community, students, educators, and the news media. This includes hosting visits by international delegations who wish to learn from Commission staff about water resource management at the river basin scale. DRBC also produces various publications and materials about the basin and water resource management issues.

The DRBC's redesigned web site, which was rolled out to the public in January 2012, continues to be a major communications tool with its emphasis on providing information that is accurate, up-to-date, and presented in a user-friendly manner. The DRBC web site makes extensive use of links to external government and other sites where additional information is available. Listserv capabilities on the redesigned web site allow DRBC to provide subject-specific information via email to recipients who have signed up to receive updates. The importance of the DRBC web site as an information tool is reflected in the amount of data transferred, which totaled 332 billion bytes during FY 2012 compared to 96 billion bytes during FY 2006. The DRBC initiated the use of several social media tools (Twitter, YouTube and Flickr) in March 2013 to reach a broader audience with news on Commission activities and related information. RSS feeds have been used since the January 2012 roll out of the redesigned website.

#### 5.3 TECHNICAL OUTREACH

In order to keep current on technical issues and to share information with peers and various stakeholders, DRBC staff members attend and/or participate in regional, state, and national conferences and workshops throughout the year hosted by other government agencies, professional groups, or other organizations. DRBC also hosts workshops on timely issues, such as PCB implementation and water loss accountability. The DRBC web site also is used to supplement this information exchange.

#### 5.4 PROMOTING STEWARDSHIP

Commission staff communicates information in various formats and, if funding allows, participates in a variety of events, workshops, and conferences throughout the basin to raise public awareness about water resource issues affecting the watershed and the need for stewardship. This includes reaching out to educators and students, as well as continued development of *Ed. Web* on the commission's web site. DRBC continues to support the Delaware River Sojourn through its membership on the steering committee.

**DRBC Water Resources Program FY 2014-2016**

**DRBC WATER RESOURCES PROGRAM  
5.0 EDUCATION AND OUTREACH FOR STEWARDSHIP**

<b>Program/Project</b>	<b>Products/Outputs</b>	<b>Fiscal Year</b>	<b>Funding Sources</b>
<b>Reporting</b>			
DRBC Annual Report	Report – post on web; limited paper copies	2014-2016	General Fund
<b>Public Information</b>			
Provide Timely Information to the Public	Clear, consistent message on water resources issues & DRBC activities; produce various handouts	2014-2016	General Fund
Media/External Relations	Clear, consistent message on water resources issues & DRBC activities; timely responses	2014-2016	General Fund
Web Site	New features, improvements, ongoing maintenance	2014-2016	General Fund
Host Foreign Delegation Visits	Information exchange	2014-2016	General Fund
<b>Technical Outreach</b>			
Conference Attendance & Presentations	Information exchange	2014-2016	General Fund
Workshops	PCB workshops	2014	General Fund
	Water Loss Accountability	2014	General Fund
<b>Stewardship Events</b>			
Community Events	Delaware River Sojourn, Bay Day, Coast Days, RiverFest, Shad Festival, HydroMania, EarthFest, educator training, misc.	2014-2016	General Fund
Event Follow-up	Information on web site	2014-2016	General Fund

## DRBC Water Resources Program FY 2014-2016

### ENDNOTES

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<sup>1</sup> MidAtlantic River Forecast Center. Cumulative 90 day Departure from Normal Precipitation through Mid-April 2010 and 180 day through June 5, 2012.

<sup>2</sup> NOAA. State of the Climate National Overview-June, 2012. <http://www.ncdc.noaa.gov/sotc/national/2012/6>

<sup>3</sup> Ibid.<sup>4</sup> Communication from J. Gheen, NJDEP; Oct. 23, 2008. Reaffirmed by A. Navoy, USGS NJ Water Science Center; June 21, 2012.

<sup>5</sup> Ibid.

<sup>6</sup> Communication from J. Myers, NJDEP, July 20, 2012.

<sup>7</sup> Source: DRBC Water Balance Estimate presentation for Decree Party Principals meeting, Suffern NY, October 15, 2012. Note: The 1960's drought is the planning objective for public water supply and salinity repulsion per the DRBC Water Code.

<sup>8</sup> The WaterSMART initiative, and its component project the Water Census, are elements of Section 9508: National Water Availability and Use Assessment Program included in the Omnibus Land Management Act of 2009 (PL 111-11; <http://www.gpo.gov/fdsys/pkg/PLAW-111publ11/pdf/PLAW-111publ11.pdf>).

**DRBC WATER RESOURCES PROGRAM 2014-2016**

**SUPPLEMENTAL TABLE A: SUMMARY OF PROSPECTIVE CHANGES TO DRBC PROGRAMS AND REGULATIONS 2014 - 2016**

<b>Management Topic</b>	<b>Program/Project</b>	<b>Products/Outputs</b>	<b>FY 2014</b>	<b>FY 2015</b>	<b>FY 2016</b>
Natural Gas Development	Water withdrawals and discharges; Watershed Management	Adoption of Water Code Article 7: Natural Gas Development regulations	Rulemaking Process and Adoption	Adoption and Implementation	Implementation
Water Supply	Planning	Comprehensive Plan - Facilities Update	Water Balance and Needs Assessments	Water Supply Options	Adoption of Changes to Comprehensive Plan (Facilities)
Flow Management	Regulated Flow Management (Reservoir Operations)	Changes to Water Code Article 2 to support FFMP	Begin Rulemaking process	Rule Proposal and Public Review	Rule Adoption
	Pass-by flows/ conservation release	Update Water Code to include pass-by flows, conservation releases, and consumptive use mitigation trigger policies	Technical Review and Analysis	Policy Options & Recommendations	Rule-development & proposal as appropriate
Project Review Fees	Docket Review and Issuance	Update the project review fee schedule for water withdrawals	Recommendations	Rule Proposal and Adoption	Rule Implementation
		Develop a new annual discharger compliance/coordination fee	Recommendations	Rule Proposal and Adoption	Rule Implementation
Water Quality	WQ Criteria	Revised PCB Criteria	Rule Adoption	Rule Adoption	Implementation
		Ammonia criteria	Rule Proposal	Rule Adoption	Implementation
		Bacteria	Pending adoption of nationwide standards by EPA		
		Nutrients	Expert Panel; Model Development	Model Evaluations	Criteria Recommendations
		Biocriteria	Review data; Create Index of Biological Integrity	Biocriteria Recommendations	Rule Proposal
		pH	Rule Proposal and Adoption	Implementation	Implementation
		DO (Zone 5)	DO Criteria Review	DO Criteria Revisions	Rule Proposal



**DRBC WATER RESOURCES PROGRAM 2014-2016**

<b>Management Topic</b>	<b>Program/Project</b>	<b>Products/Outputs</b>	<b>FY 2014</b>	<b>FY 2015</b>	<b>FY 2016</b>
		Temperature (Zones 1A-E)	Temp. Criteria Revisions and Implementation Strategy	Rule Proposal	Rule Adoption
	Toxics	Develop criteria for Dioxin/Furans TEQs Data summaries and criteria recommendations from TAC	TAC Criteria Subcommittee evaluation	Committee Recommendations	Rule Proposal if appropriate
	SPW	Antidegradation targets (EWQ) defined for specific ICPs/BCPs in Middle & Upper to replace reach-wide targets	Assessment finalized; Targets recommended	Rule Proposal & Guidance	Rule Adoption
		Measurable Change assessment at BCPs in Lower Delaware	Assessment finalized, Targets recommended	Rule Proposal & Guidance	Rule Adoption
Flood Mitigation	Flood Water Management	Recommendations on Basin-wide Reservoir Operating Policy for flood management	Review of Basin reservoir operating plans & capacity for flood storage	Recommendations for reservoir operating	
Interagency Coordination	Permit Streamlining	Reduction of redundancy & maintenance of integrity in DRBC/State NPDES permitting process	Convene ad hoc committee; Public process; AA changes and Rule proposal for permit process revisions	Rule Adoption/Implementation	Implementation
Administrative Code Updates	Rules of Practice and Procedure	Consistency with AAs	Following final AAs and permit streamlining (see above)		
		Consistency with Natural Gas regulations	Concurrent with Natural Gas Rule - Article 7 (see above)		
	Water Supply Charges	Changes to Admin. Manual Article 5	Consultant study	Committee recommendations	Rule Proposal if appropriate

**DRBC WATER RESOURCES PROGRAM FY 2014-2016**

**SUPPLEMENTAL TABLE B: SUMMARY OF MODELING PROJECTS 2014-2016**

Program/Project	Products/Outputs	Fiscal Year	Funding Sources
Flow Management – FFMP Support	Use of and incorporation of various upgrades into OASIS model, to support the evaluation of water supply management options, chloride intrusion, and support Decree Party negotiations	2014-2016	General Fund
Decision Support System (DSS)	Support for FFMP assessments. Model links to evaluate impact of reservoir operations on habitats	2014-2016	General Fund
Flow Management – FFMP Support	Modification of existing model to reflect NYC's OST Support Tool. Revised model will be referenced as DRB-PST (Planning Support Tool)	2014 - 2016	General Fund
Emergency Response	Real time one-dimensional flow and transport model	Daily	General Fund
	Water quality model	As needed	
Lower Delaware River & Tributaries Model	Model refinement, calibration and validation	2014-2016	EPA §106, NPS and General Fund
Brodhead Model	Model refinement, calibration and validation	2014	General Fund
Neversink Model	Model refinement, calibration, and validation	2014-2015	General Fund, EPA §106, Pinchot Institute
Lehigh River Model	Model refinement and validation	2014-2016	General Fund
PCB Homolog Modeling	Revised TMDLs for Zones 2 – 6 and supporting documentation	2013	General Fund and Section 106
Eutrophication Model for Delaware Estuary	Development of screening level 1-D eutrophication model	2014	EPA §106 Pending
	Selection and development of a state of the art 3-D hydrodynamic and eutrophication model. Data collection for model calibration	2014 - 2015	EPA §106 Pending
	Model calibration and validation for CBOD reallocation, potentially NBOD and/or ammonia allocations and other nutrient parameters	2015 -2016	EPA §106 Pending
CORMIX mixing zone models	Project Review and NPDES permit support	As needed	Project Review Fees

**DRBC WATER QUALITY REVISIONS**  
**3 Year Plan ~ Criteria Development Tasks**

Revised 8/1/2012

REGULATION AREA	POLICY/ CRITERIA	ACTION	PARTICIPANTS	FFY 2012				FFY 2013				FFY 2014			
				4th Q CY2011	1st Q CY2012	2nd Q CY2012	3rd Q CY2012	4th Q CY2012	1st Q CY2013	2nd Q CY2013	3rd Q CY2013	4th Q CY 2013	1st Q CY2014	2nd Q CY2014	3rd Q CY2014
Criteria Based Programs	Nutrients	Subcommittee recommends nutrient criteria to WQAC	Nutrient Subcommittee												
		WQAC recommends nutrient criteria for adoption	WQAC												
		Monitoring of estuary dischargers	DRBC												
		Estuary Eutrophication Model	DRBC												
		Expert Panels convene on Modeling	DRBC, WQAC												
	PCBs	Develop Water Quality Standards Implementation Plan	DRBC, EPA	COMPLETED											
		Propose WQSIP for Adoption	DRBC	COMPLETED											
		Phase II TMDL coordination	DRBC, EPA												
	Toxics	Subcommittee evaluates available data and TEQ approach for dioxins/furans.	DRBC, Criteria Subcommittee												
		Develop criteria for Dioxin/Furans TEQs	DRBC, Criteria Subcommittee												
		TAC recommends criteria for Dioxin/Furan TEQs and for adoption	TAC												
	pH	Review / Revise pH Criteria	DRBC, WQAC	COMPLETED											
		Advisory Committee recommends revised pH criteria for adoption	WQAC	COMPLETED											
	Temperature	Develop Revised Temperature Criteria	DRBC, WQAC												
		Advisory Committee recommends revised temperature criteria for adoption	WQAC												
	Ammonia	Develop Ammonia Aquatic Life Criteria (Acute/Chronic) based upon EPA recommendations	DRBC, TAC	Pending Adoption of Nationwide Ammonia Standards by EPA											
		Advisory Committee recommends revised ammonia criteria for adoption	TAC												
	Bacteria	Develop revised bacterial criteria based upon EPA recommendations	DRBC, WQAC	Pending Adoption of Nationwide Bacteria Standards by EPA											
		Advisory Committee recommends revised bacterial criteria for adoption	WQAC												
	DO	Review / Revise DO Criteria based upon existing uses	DRBC, WQAC												
		Advisory Committee recommends revised DO Criteria for adoption	WQAC												
		Review / Revise DO Criteria based upon highest protected use	DRBC, WQAC												
		Advisory Committee recommends revised DO Criteria for adoption	WQAC												
* Note: Actions performed in this plan would advance water quality criteria revisions to the point of presentation to DRBC Commissioners and/or EPA. Further actions beyond those listed in the plan are required for promulgation of revised criteria/standards.															